SCIENTIFIC AMERICAN

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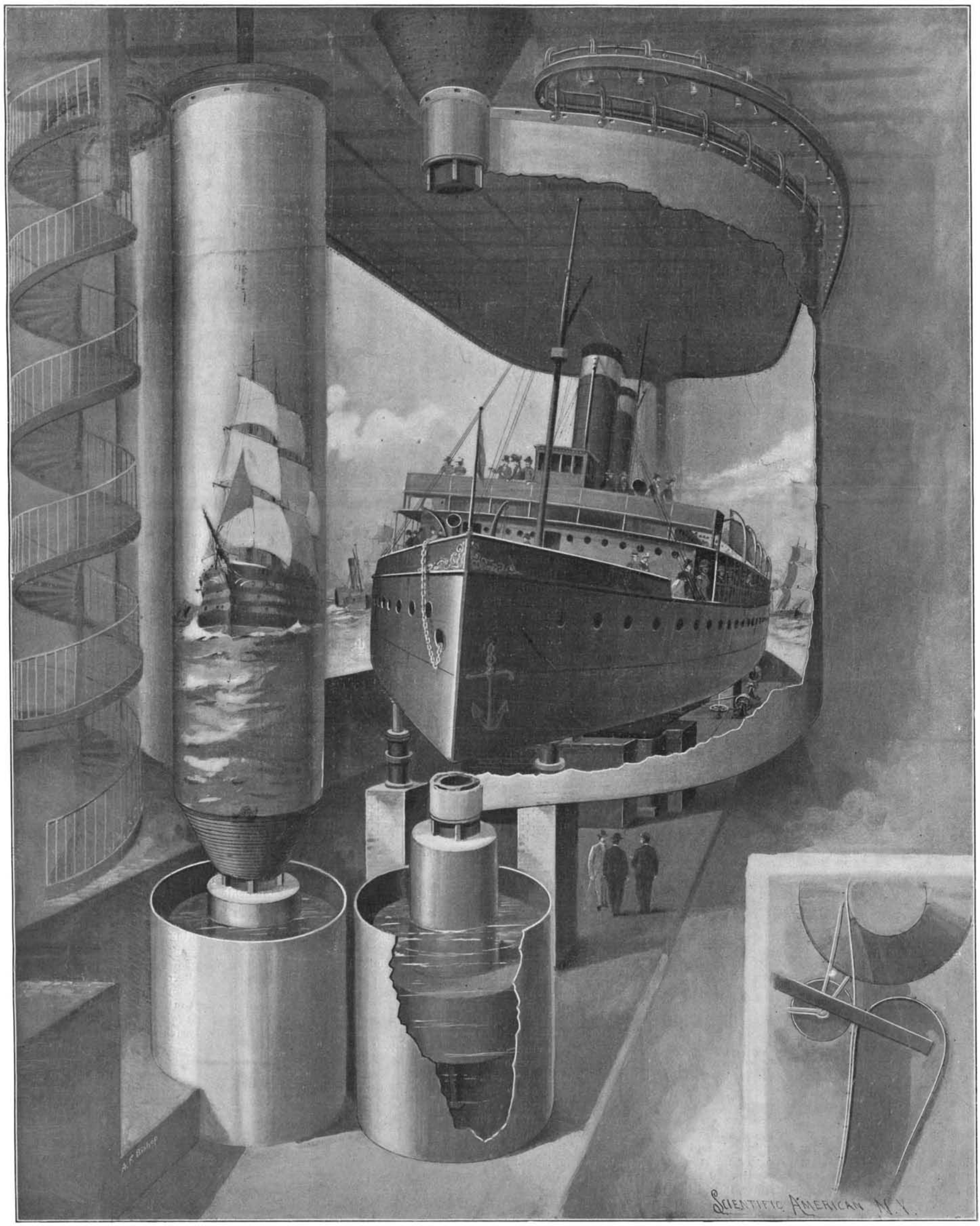
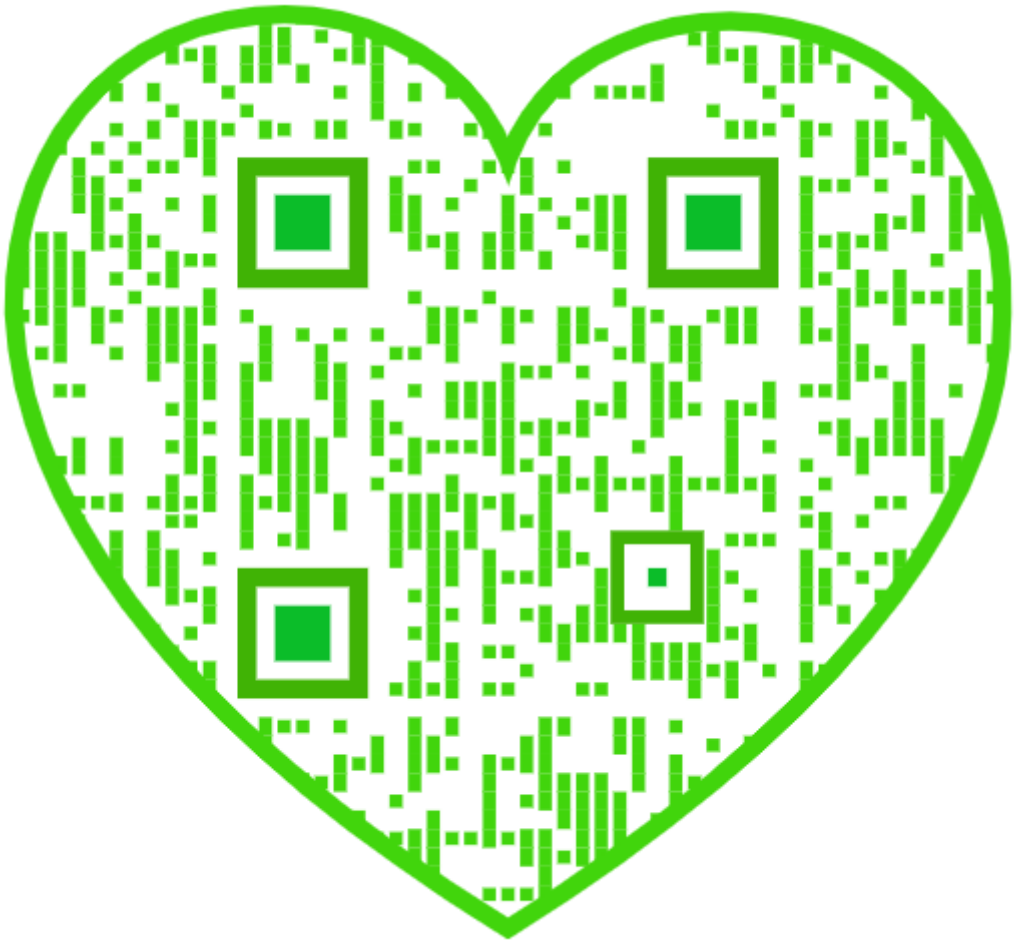


THE MAREORAMA AT THE PARIS EXPOSITION—A COLOSSAL PANORAMA VIEWED FROM THE DECK OF A SHIP.—[See page 198.]



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NEW YORK, SATURDAY, SEPTEMBER 29, 1900.

ANOTHER "INVENTION"—A 70 KNOT SUBMARINE BOAT?

The editor frequently receives communications from correspondents who evidently have a taste for matters of scientific and mechanical interest, asking that the SCIENTIFIC AMERICAN take up for discussion subjects which the correspondents have found treated in flamboyant style in the columns of the daily press. As a rule, if the subject has not been taken up for discussion in the SCIENTIFIC AMERICAN, it may be assumed that there are good reasons for silence on the part of the editor. So many startling scientific items appear in the columns of the daily press that are utterly fabulous in nature that it is quite impossible for the editor to take up all subjects therein treated for consideration. One of the most flagrant instances of this character has recently come to our notice. In the columns of a daily contemporary recently appeared an article descriptive of a "disappearing" submarine torpedo boat, said to have been recently added to the navy. An elaborate engraving accompanied the article, showing in detail the interior construction of the boat.

It was stated in the article that "for two years a force of workmen specially selected from the government yards has been engaged in the construction of this model boat. The main difficulty encountered has been a device for stopping and slowing the boat when running at high speed. Even the 'Turbinia,' which yields a speed of 37 knots, is slow by the side of this boat, in which a trial shows it to be easy to develop 70 knots an hour. The amazing speed obtained under these tests has caused the utmost surprise, not only to the people in the Naval Bureau of Construction, but also to the inventor himself, who did not expect more than 40 knots at the utmost."

The picture of a submarine boat being driven at the rate of 70 knots an hour naturally caused the editor some uneasiness, but the description of the boat was so circumstantial and the medium in which the article appeared was of so high a character, it was thought that the subject at least should be examined into. With this object, a representative of the SCIENTIFIC AMERICAN called at the Bureau of Construction in Washington and innocently asked for full details of the construction of the boat, with a view to verifying the published description and also to substantiate the tests alluded to. The Chief Constructor informed our representative that he had never heard of the submarine boat in question and that the newspaper article was absolutely false. Other inquiries brought out the fact that the boat was quite unknown in Washington.

This case, of course, is a flagrant one, but it is by no means an unusual occurrence, and should serve as a warning to the general reader not to place too much confidence in technical articles appearing in the lay press.

The article that we have been discussing differs in one important particular from those which ordinarily come within our ken. As a rule, articles of this character set forth in rather glowing colors achievements which are, at some future time, to be attained, but in the present case the writer has been dealing with cold facts, and the figures that he gives and the tests that he quotes are put forward as having been actually accomplished. The effrontery of advancing statements of this character appears to be more brazen than the usual method of forecasting the wonderful achievements that are to be attained at some future time. We are glad to learn that the inventor of this extraordinary production has succeeded finally in discovering some means by which the enormous speed attained may be reduced and controlled, and that it is possible to slow the boat down to a full stop. In this respect he is far more successful than the late lamented Keely, whose chief difficulty, it will be remembered, in obtaining final success with his motor, was the difficulty of controlling the powers which he, through the conjuring touch of his genius, had created.

THE GALVESTON DISASTER.

Not since the Johnstown disaster has the country been more horror stricken than over the destruction, or partial destruction, of Galveston. The sympathy aroused has been well nigh universal. That this sympathy is more than a mere sentiment is shown by the generous contributions that have flowed in from all sections of the country. The accounts describing the conditions preceding and following the terrible disaster have been fully described in the contemporary press and need not be dwelt upon now. The civic authorities have had a very serious problem to deal with in addition to the immediate horrors with which they were surrounded, namely, the policy to be adopted with reference to rebuilding the city. The frequent visitations of floods to the city of Galveston render this problem a very difficult one to determine. Galveston is situated at the extreme end of an island some thirty-five miles long, which varies in width from one to five miles. The part of the island upon which the city is located is almost flat and its highest point is only about eight feet above mean tidewater. The bay, which is known as West Bay, separates the mainland from Galveston Island and extends about eighty miles inland. The harbor itself was an important one, the United States government having expended some six millions of dollars in building jetties and wharves for the purpose of providing the city with a deep-water sea port, and its facilities for handling commerce were unsurpassed. The importance of the city may be determined from the fact that the exports have amounted to as much as a hundred million dollars a year.

Once before has the city of Galveston been visited by a most destructive flood, and many times has it been seriously threatened. It is no wonder, therefore, that the question of abandoning the present site was seriously contemplated. It has been determined, however, to rebuild the city on the present site. In the first place, one of the prime influences which tended to this was the feeling of civic pride and the love of home which is implanted in every one's breast, and the immense value of property still remaining comparatively intact. Then, again, the possibility that additional defenses can be erected against future storm inundations is probably a controlling factor.

From an engineering point of view the question which presents itself is whether it will be possible to provide any means for the protection of the city against a recurrence of this dreadful visitation. In these days of progress we are inclined to regard scarcely any object as beyond the reach of attainment from an engineering or mechanical point of view; and although the physical conditions in the present case seem to render the problem almost hopeless of solution, it would seem that some method would be devised by means of which at least the lives of the inhabitants might in the future be vouchsafed. The late storm, of course, was an exceptional one, but the cruel fact must be faced that the city lies in the pathway of tropical storms, and that similar conditions will probably again arise.

What course will be taken by the authorities in obtaining protection against the loss of life and property in the future remains to be seen, but there is no doubt that some practical methods will be suggested by engineers which will at least lessen the dangers that in the past have so frequently afflicted the city.

NEW TORPEDO DESTROYERS FOR HOLLAND.

In a recent issue of the SCIENTIFIC AMERICAN appeared an article relative to the consumption of petroleum for the propulsion of vessels. Tentative efforts have been made by one or two of the powers to avail themselves of this fuel, but the experiments have not been sufficiently exhaustive to prove the efficacy of the oil for this particular class of work. That petroleum is an advantageous, economical and powerful fuel has been amply demonstrated by the utilization of it for the propulsion of the express locomotives of the Great Eastern Railway in England. Many of the fleetest express trains upon this system consume oil, and so satisfactory have been the experiments, that several other engines are being equipped with the necessary apparatus.

The Dutch government are also determined to prove the efficiency of oil for marine purposes. Messrs. Yarrow & Company, Limited, the well-known shipbuilders of Poplar-on-Thames, England, have just constructed two first-class topedo boats, "Hydra" and "Scylla," for the Dutch government, and they are intended for service in the Dutch East Indies. They are each 130 feet in length over all, with 13 feet 6 inches beam, and have a displacement of about 90 tons.

The machinery for propelling these crafts consists of a set of inverted triple expansion surface condensing engines of 1,200 I. H. P. The air and feed pumps are driven off the forward end of the crankshaft. There is one very important feature, however, which has been introduced into these engines, which causes them to differ from the machinery supplied to torpedo boats. That is the introduction of the system of forced lubrication, analogous to that which is sometimes adopted in certain land engines. By the utilization of this principle the working parts of the engines are completely inclosed. The great advantage accruing from this principle is that the engineering staff need not evince the least anxiety regarding the lubrication of the engines, which is most essential to insure smooth and perfect running. Consequently, if the exigency arose, the engine room staff could be decreased, as the lubrication being practically automatic does not require attention.

Water tube boilers of the Yarrow pattern have been adopted. The tubes are naturally straight. This type of boiler, by the way, as the result of continued practical experiments, has been proved by the naval authorities of the various powers to be eminently satisfactory, and it is being widely installed in a large number of battleships.

Both vessels have been supplied with Holden's oil spraying apparatus, which is the same as that employed upon the Great Eastern Railway, since the government intend to burn astatki. This oil is plentiful in the Dutch possessions in the East Indies, and, therefore, as its cost will be very small, there is no doubt that the Dutch naval authorities will be able to effect a very appreciable saving in their coal bill. Both the vessels went under a full speed official trial to test the possibilities of this oil spraying apparatus, and it worked smoothly and without the slightest difficulty.

In the official speed trials, which were carried out under the superintendence of Mr. Loder, the chief constructor of the Royal Dutch navy, the vessels attained a mean speed of 24·37 knots per hour for three hours, with a pressure of 160 pounds, imparting about 400 revolutions per minute to the propellers.

The armament of the vessels consists of three 18-inch swivel torpedo tubes and two 6-pounder quick-firing guns.

HAND-LABOR IN CHINESE MINES.

According to a report presented by M. Levitoff to the Russian Society of Encouragement, it appears that Chinese hand-labor has made its appearance in the Trans-Baikal region since the construction of the railroad, and the influx of the Chinese element is becoming more considerable every day. Hand-labor, which has been scarce ever since the construction of the Trans-Siberian, is now more abundant, and its cost has been considerably reduced. On the Amoor River, the unloading of boats, which was paid only a few years ago at the rate of $1.60 per ton, is now paid at $0.80 per ton, or one-half. In general, the Chinese workman, on account of his smaller productiveness, is paid only one-half the wages of a Russian workman. As an example, in the cement works of Siberia, $0.80 per day is paid to a good Russian workman, and only $0.40 to the Chinese workman. Generally these are engaged for $2.50 to $3 per month by the Chinese contractors, who supply the food and lodging. Even on this small pay, the workmen contrive to save money and send their savings to China. The Chinese excel in certain kinds of labor, such as gardening, shoemaking, etc., where the Russian cannot compete in price, but, on the contrary, he is not good for all kinds of work, and especially refuses to work in the water, or even in damp places. For masonry work, it is estimated that a Russian workman, himself inferior to an Italian, equals four Chinamen. Among the Siberian industries, it is the gold mines especially which have adopted Chinese labor. Formerly, in the mines belonging to the Czar, it was forbidden to employ the Chinese; but when on account of the scarcity of hand labor the price had reached $0.25 per pound of gold, the government decided to let out the work to contractors. The Chinese were engaged by these for $0.13 per pound, which reduced considerably the price of the gold extracted. M. Levitoff remarks that the Chinese carriers in the region between Irkutsk and Khabarovsk have the habit of stealing the gold and sending it to China. Another thing to be deplored is the clandestine sale of Chinese brandy, called khanchine. In spite of the advantages enumerated, the writer says that it is urgent to stop the invasion of the Chinese element, and he recommends emigration from the rural population of European Russia.

TRAFFIC IN EUROPEAN PORTS.

The figures have been recently given for the maritime traffic in the principal European ports for the year 1898, according to the official statistics. The port of London comes first for the number of ships as well as the tonnage; it received, in 1898, 11,306 vessels of a tonnage of 9,400,000. After London follow, in the order of tonnage, Hamburg, with 7,990 vessels and 6,700,000 tons; then Antwerp, with 5,358 vessels and 6,500,000 tons; Liverpool, with 3,652 vessels and 6,200,000 tons; Rotterdam, 5,881 vessels and 5,400,000 tons; Marseilles, 4,141 vessels and 4,400,000 tons. Genoa has 2,339 vessels and 2,500,000 tons; then come Havre, with 2,375 vessels and 2,300,000 tons; and Trieste, with 8,708 vessels and 2,100,000 tons; then Bremen, 2,494 vessels and 2,100,000 tons; and Amsterdam, 1,734 vessels and 1,400,000 tons. Since 1871 the tonnage has almost doubled at Liverpool. It has more than doubled at Bremen, Trieste, Genoa, Marseilles and Havre; tripled at London, and more than tripled at Antwerp, Amster-

dam and Rotterdam. At Hamburg it has almost quadrupled. In 1871, Liverpool took the lead with 3,300,000 tons, then came London with 3,100,000 tons, all the other ports being far in the rear. Antwerp, Hamburg and Marseilles received but 1,800,000 tons. London has surpassed Liverpool since 1875; and Antwerp and Hamburg also surpassed it in 1893. Antwerp even took second place in 1897, but yielded it to Hamburg in 1898. The increase of tonnage is due especially to the increase in the dimensions of vessels. From 1871 to 1898 the actual number of vessels has diminished for the ports of Marseilles, Havre, Genoa and Liverpool; it has increased at least 12 per cent for Bremen, Trieste, Antwerp, Amsterdam, and 27 per cent for London; for Rotterdam it has increased 65 per cent, and for Hamburg 90 per cent.

THE HEAVENS IN OCTOBER.

BY HENRY NORRIS RUSSELL, PH.D.

The planets which show so brightly in the evening skies are passing out of sight toward the sun, and the shortening days and the chilly air are no clearer signs of the arrival of autumn than is the appearance above the eastern horizon of the advance guard of the familiar winter constellations.

At 9 P. M. on October 15, Taurus is well above the eastern horizon, recognized unmistakably at once by the Pleiades, below which is the equally distinctive but perhaps less familiar group of the Hyades in form of a V lying on its side. At its lower extremity is the brilliant red Aldebaran, which marks the eye of the Bull, and between this and the point of the V is the pretty double star Theta Tauri, which is easily divided by an ordinarily good eye, the component stars being about 5½ minutes of arc apart. It seems almost incredible, however, when looking at the stars that their distance is over one-sixth of the moon's apparent diameter, but such is actually the case, as the moon's diameter averages about 31 minutes of arc.

North of Taurus is Auriga, the charioteer, marked by the bright yellowish star Capella, whose spectrum shows it to be very much like our sun in constitution.

Above and to the right of Taurus an oblique triangle of moderately bright stars forms the head of Aries, and further north is the conspicuous constellation Perseus, in the Milky Way, with Cassiopeia higher up.

A little east of the zenith is the great square of Pegasus, between which and Perseus is Andromeda.

Almost the whole of the southeastern sky is filled with the huge shapeless mass of Cetus. The head of the monster is marked by an irregular pentagon of stars almost below Aries, while Beta, the brightest star in the constellation, stands almost alone, a little to the left of the southward extension of the eastern edge of the great square of Pegasus. The two lowest stars of the head, with another smaller one below, form an obtuse angle triangle, not unlike the head of Aries, and the longest side of this triangle, if extended to the right for a little less than its own length, points out the remarkable variable star Mira, the first object of the kind known. For most of the time it is of the ninth magnitude and entirely invisible to the unaided eye, but at intervals of about eleven months it brightens up enormously, becoming occasionally the brightest star in the constellation, and being in such a case about 1,000 times as bright as at its minimum. It usually remains visible to the naked eye for about six weeks. The star is now approaching a maximum, which will afford a good chance to watch its light without losing sleep for the purpose.

The only other conspicuous object in the southern sky is Fomalhaut, a lonely bright star, low down near the meridian, belonging to the constellation of the Southern Fish.

West of the zenith are Cygnus, Lyra, and Aquila, Hercules and Ophiucus are lower down, and in the north the Dipper is swinging low, with the pointers almost under the pole.

THE PLANETS.

Mercury is evening star in Virgo and Libra throughout the month. On the 29th he reaches his greatest eastern elongation, but is not favorably placed for observation, being very far south and setting less than an hour after the sun.

Venus is morning star in Cancer and Leo, rising about three hours and a half before sunrise throughout the month. She is still very much brighter than anything else in the morning sky, though her light is not much more than half what it was in August. Mars is morning star in Cancer, rising before 1 A. M. and gradually, but slowly, increasing in brightness as the earth overtakes him.

Jupiter is evening star in Scorpio. By the middle of the month he sets at 8 P.M. and before its close he can only be seen in the twilight.

Saturn is also evening star in Sagittarius, setting about 9 P. M. in the middle of the month.

Uranus too is evening star. On the 19th he is in conjunction with Jupiter, being less than half a degree south of the latter, and could be easily identified with a field-glass, were it not that both planets are very low in the twilight.

Neptune is in Taurus, rising about 9 P.M., but it is always invisible to the naked eye.

THE MOON.

First quarter occurs on the evening of the 1st, full moon on the morning of the 8th, last quarter on the night of the 14th, new moon on the morning of the 23d, and first quarter again on the night of the 30th. The moon is nearest the earth on the 7th, and farthest from it on the 20th. She is in conjunction with Neptune on the morning of the 13th, with Mars on the evening of the 16th, with Venus on the afternoon of the 19th, with Mercury on the morning of the 25th, with Uranus and Jupiter on the afternoon of the 26th, when an occultation of Jupiter will be visible in the Western States, and with Saturn on the morning of the 28th.

THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The first and most obvious difference between the American and British meetings is the great prominence given to the meeting here by press and people. All the newspapers in the United Kingdom teem with full reports of the proceedings, while the local papers give many full pages daily to the reports.

The attendance of members and associates exceeded nineteen hundred. Many papers of great scientific interest were presented, beginning with the address of the president, Sir William Turner,* and the several presidents of sections.

Prof. Turner discussed at length the problem of cell life in organisms both animal and vegetable, but his address has been already published in full, so I need not attempt to summarize it.

Probably the boldest of the addresses of presidents of sections was that of Prof. W. J. Sollas to the geological section, in which he essayed the difficult task of harmonizing Kelvin's and Joly's estimates of the age of the earth. An exhaustive review of the whole subject from the best data attainable seems to show an age of somewhere near 100,000,000 years.

Sir George Robertson, in the geographical section, made a very patriotic address, and therefore very pleasing to the people here. He urged the necessity of government control and extension of ocean cables and of means of transportation.

Electricity is, after all, the dominant feature of the meeting. Important papers were read on theoretical and practical questions connected with it.

On the side of theory was a long discussion of ions, by such men as Lodge and Fitzgerald, in which, however, no really new ideas seemed to be brought out, at least none that could be accepted as adequate explanations of the remarkable phenomena involved, which really are so intimately connected with the ultimate constitution of atoms and molecules as to require for their solution a knowledge of the alternate constitutions of matter.

In practical applications of electricity, an epoch-marking paper was that of Sir Wm. Preece, describing the complete success of wireless telephony in actual operation over a distance of about eight miles from the north coast of Ireland to a near island, and capable of extension certainly for several miles further, and this with comparatively short base lines. The success of this experiment resulted from the discovery that the efficiency of the apparatus was vastly enhanced by connecting the wires with plates at each end immersed in water.

The speaker recommended the system as applicable to communication from ship to ship by stretching the wire in each ship from bow to stern, bringing it up around over the topmasts. This, when ships are nearly parallel to each other, must give excellent telephone communication. How it would be with ships at right angles is not yet known,

Sir Wm. Preece also presented a project for a monorail electric railway, devised by Mr. Behr, and soon to be actually constructed between Liverpool and Manchester, 34½ miles. This distance will be covered in twenty minutes more cheaply, comfortably and safely than ordinary surface travel. The car, weighing 45 tons and seating 64 persons, rides a sinlge rail saddle-wise with its center of gravity below the rail, and having guide wheels on each side supported on light ties. There will be no stops between stations, but electricity of 10,000 volts pressure will be transmitted over the wire, and reduced to one thousand volts, at which it will be supplied to the motor and by actuating it with 1,600 horse power at the start will communicate velocity to the car at the rate of 1½ feet per second, which is as much as can be given with comfort to passengers, till after 110 seconds the car attains a velocity of 110 miles an hour, when 500 horse power will maintain it.

Mr. Aldrich described an electric automobile bus, supplied by light overhead trolley system of two wires; which, as it requires no rails, is the most economical means of road propulsion, and the system is actually in successful operation in the outskirts of Paris. Kinematograph views of the bus in motion were given—the first time the kinematograph has been used in the association.

* This lecture is published in the current issue of the SUPPLEMENT.

The lecture to workingmen by Silvanus P. Thompson was on electricity applied to industries, and brought a great throng to St. George's Hall. The lecturer said that whereas the nineteenth century had been the age of steam, the twentieth must be that of electricity. He urged the consumption of coal at the mouth of the mine, and generation of electric power, to be thence distributed, thus saving the cost of transportation of coal, the great loss in generating power by applying it as now in production of steam, and the purification of the air from the oppressive smoke cloud which overlies the whole north of England. He says that England can produce electric power cheaper by the use of coal in this way than America can by utilizing her abundant water power.

The lecture of Prof. Gotch on animal electricity showed a wonderful power generated by several electric fishes, notably the malapterurus, which has 3,000,000 cells consisting of nerve ends arranged beneath its skin, and gives a sharp electric shock.

Prof. Perry, in commenting on this paper, said that these studies were of immense practical value, because by the study of animal life we should probably succeed in securing electro-chemical composition of fuel, which is that whereby the animal utilizes its food, and this means the utilization of 98 per cent of the fuel instead of the waste of 88 per cent of it now made in the best marine engines down to 99½ per cent in poor engines.

Space must still be found for a word as to the fine Municipal Technical School and the fine exhibit of industrial work there. It is pronounced exactly adapted to the needs of industrial workers in Bradford. A fine array of textile fabrics produced by students was shown. Several looms were seen in actual operation, also machines for testing strength of material. I was particularly struck by the excellent imitation of silk produced by mercerization of cotton, a process named after Mr. Mercer, of Bradford, who invented it. The process consists in stretching a hank of cotton thread taut between two bars, and, while stretched, immersing it in suitable liquid; several kinds are used, the most simple being water, which produces a marked effect in giving the silky gloss. The thread is also dyed while still stretched. While the mercerized fabric has very much the appearance, it has not at all the strength of silk.

The next meeting will be held at Glasgow, beginning September 11, 1901, and the meeting for 1902 will be at Belfast. Some of the members already begin to talk of arranging another American meeting soon.

Prof. A. W. Rücker, secretary of the Royal Society, has been elected president of the Glasgow meeting.

WILLIAM H. HALE.

THE INTERNATIONAL PHYSICAL CONGRESS.

The International Physical Congress opened at Paris on August 6, with President Cornu in the chair. Among those present were Lord Kelvin, Prof. Alexander Graham Bell, Prof. John Millis, Prof. Cleveland Abbe, Prof. Arthur G. Webster, Secretary S. P. Langley, of the Smithsonian Institution, and Carl Hering. The French vice-presidents were MM. Cailletet and H. Poincaré and the foreign vice-presidents were Prof. Alexander Graham Bell, Sir W. Roberts-Austen, M. Schivendoff of Russia, Herr Warburg of Germany, Herr Vanderwaals of Holland, M. Exner of Austria, Signor Righi of Italy.

The Congress comprised seven sections; the first dealing with general questions, such as measuring units and teaching; second, mechanical and molecular physics; third, optics and thermodynamics; fourth, electricity and magnetism; fifth, magneto-optics, cathode rays, etc.; sixth, cosmical physics; seventh, biological physics.

Each section was provided with a president, one French and two foreign vice-presidents, and two secretaries. The programme included seventy-eight papers, which, when published, will make three volumes. Many of them were of the highest possible interest, specially those of Prof. Poincaré and Prof. Kelvin, the former dealing with the philosophy and methods of physical science, the latter with the ether hypothesis. The President of France held a reception for the members of the Congress; Prince Roland Bonaparte also held a reception for them. Many of the papers were illustrated, and demonstrations were given by MM. Becquerel, Curie, Cornu and others. Mme. Curie, who is well known for her brilliant discoveries in physical science, was secretary of one of the sessions.

THE CHICAGO AUTOMOBILE SHOW.

An international automobile exhibit and race meet opened at Washington Park, Chicago, Ill., September 18. More than four thousand persons witnessed the contests, and the grandstand was crowded. Among the events were automobile parades for manufacturers, races for steam, gasoline and electric automobiles, obstacle races, automobile parades for private owners, 10-mile races, 5-mile races for motor tricycles, etc. The short distance automobile speed records were broken by T. E. Griffen, who made a mile in 1 : 06. Alexander Winton made 10 miles in 16 : 02.

THE "FORTIS" ELECTRIC EXERCISER.

For the purpose of combining with the benefits to be derived from an exerciser the hygienic effect of electricity, the Badger Brass Company, of Kenosha, Wisconsin, have recently introduced the apparatus pictured in our illustration.

In appearance the machine resembles the ordinary exerciser with elastic cords passing over pulleys; but the cords here serve as conductors, and the handles as electrodes. Somewhat below the middle portion of the board a cell is held in a recess and wired to an induction-coil, secured to the upper part of the board, so that the current strength can be increased. The induced current is conducted through the elastic cords to the handle and back again. In order to interrupt the battery current and incite a secondary current in the coil, one of the pulleys is provided with an interrupter, which, in turning with the pulley, automatically makes and breaks the circuit as it passes a contact secured on the pulley-block and wired to the secondary coil. The pulley is suspended from a hook forming part of a movable plate which constitutes a circuit-controller. When the cord is pulled, the hook-plate is drawn forward against a stop to complete the circuit. When the handle is released, the hook-plate is automatically retracted to break the circuit.

A metallic foot-plate furnished with the apparatus can be placed in the circuit, so that the current can be passed through the body. By means of a conveniently located switch, the current can be directed from either hand through the body to the other hand, or by means of the foot-plate through the body to the feet, or vice-versa. By drawing out the slide of the induction coil, the current can be regulated in strength to meet the requirements of all persons.

The stimulating effect of electricity has long been recognized by medical men. The physical development resulting from the use of exercisers has earned for the elastic cord machine a wide popularity. The benefits to be derived from an electric exerciser in which muscular exercise is combined with electrical stimulus are, therefore, so obvious that further comment is hardly necessary.

ELECTRIC EXERCISER.

A PHOSPHATE TRANSPORTER AT SFAX.

The mining of phosphates comprises one of the staple industries of Tunisia, and at Gafsa are situated the extensive mines and plant owned by the Compagnie des Phosphates et du Chemin du Fer de Gafsa. The daily output at Gafsa by this company runs into several hundred tons, and large storehouses have been erected for the temporary storing of the product, until it can be dispatched to the coast. Unfortunately, the mines are situated 156 miles from Sfax, the port of shipment; consequently the question of freightage is a very important one. As a rule the company dispatch by rail about 700 tons of phosphates from Gafsa to Sfax every day. On its arrival the product is either transferred direct from the freightage cars into the hold of the ship or transferred to storehouses to await the arrival of the vessels. They have one immense storehouse 262 feet in length by 65 feet wide and 46 feet high, constructed of armored cement, which is capable of holding 15,000 tons.

Such a tremendous output every day necessitates the employment of extensive mechanical plant, to insure the phosphates being transferred with all possible speed from the cars to the ship or store, and the loading of the vessels. The company recognized the importance of this rapid handling of the material, and consequently determined to install a transporting plant that should coincide with their requirements. In the selection of such an appliance however they were hampered by two difficulties. In the first place, the authorities controlling the quay would not permit the erection of any structure, either movable or fixed, within less than 24½ feet from the water's edge, and neither would they allow any excavations to be made below a depth of 4½ feet. Then again the company desired a plant that would be able to hold their own wagons, so that extra expenditure in this direction might be obviated. Then again it was imperative that the transporting arrangements should be done in such a manner that the phosphates should be protected from the weather, and that at least 3,000 tons of material should be transported daily.

This transporting plant has recently been constructed by the Temperley Transporter Company, of London, who have supplied two of their traveling towers, a photograph of one of which we reproduce herewith, in order to comprehensively illustrate the principles embodied in the apparatus. Each tower is 75 feet in height, and the transporter beams which carry the skips are each 111 feet in length, with an incline of 1 in 4. Two skips are provided on either transporting beams with a capacity of 35 hundredweight each. It will thus be seen that 7 tons of material can be in movement at one and the same time; and as the round trip of a single skip only occupies one minute, 420 tons can be transported in one hour, which easily enables the contracted minimum amount of 3,000 tons per diem to be accomplished.

Each tower is mounted on twelve wheels, two of which on either side act as driving wheels, running upon a railway of 28 feet gage. The tower is equipped with three platforms, the upper of which contains the portable boiler for supplying steam to four sets of engines, three of which are placed on this same platform, and one on the platform immediately beneath it. The two principal engines on this upper platform serve as the winding engines for the transporter, and are capable of lifting the loaded skips at a speed of 300 feet per minute. The remaining engine supplies the power for propelling the entire structure along the railway, and for driving capstans, etc.

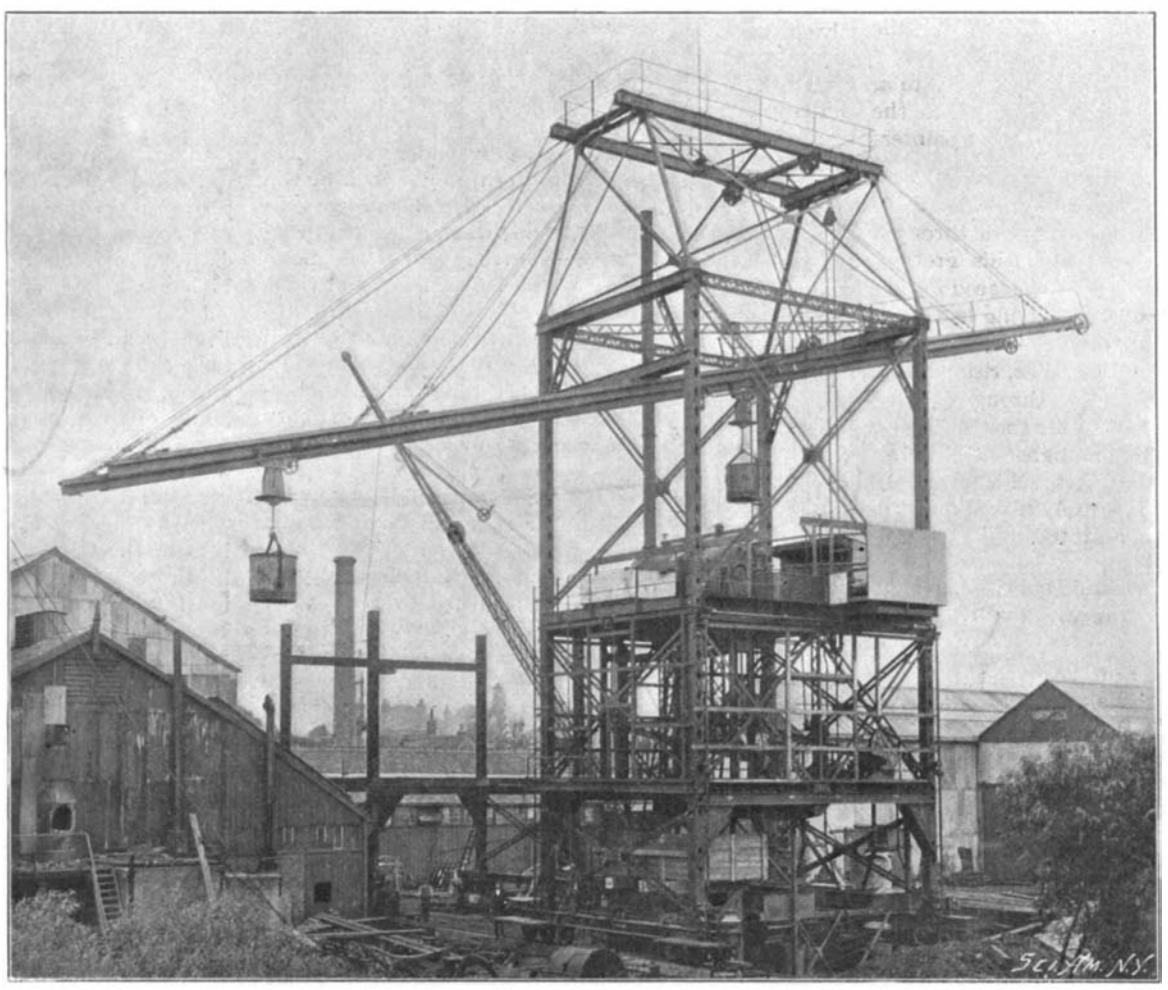
The wagons, laden with phosphates, run along the railway underneath the tower. These wagons are fitted with side doors so that the contents cannot be dumped out, but have to be removed by the aid of shovels. To accomplish this operation with celerity, the makers devised a large mechanical shovel, consisting of a large plate suspended by hinges at its upper edge, and which oscillates by means of a pair of cranks and connecting rods. The hinges are mounted on nuts, carried by long vertical screws, which are driven by gearing and so feed the shovel to its work. The shovel itself is almost the same length as the interior dimensions of the truck to be emptied, and at the limit of its downward motion its bottom edge clears the floor of a new wagon, when empty, by about 1½ inches. This mechanism is driven by the single cylinder vertical engine placed on the second platform, and upon this also stands the operator, supervising the emptying of the wagons below, who is thus enabled to obtain a full view of the work in progress. The shovels make two complete oscillations per minute.

The contents of these wagons are deposited by means of these shovels into two hoppers below, and these latter are discharged into the skips traveling on the transporting beam, which are lowered by the transporters on to a roller bed at the base of the tower. The skips are then detached, run underneath the hoppers, and thus filled. They are then hauled back, once more attached to the traveler, and carried to the destination at which it is desired to deposit the contents. The company stipulated that the phosphates should be protected from the weather, and to insure this the tower is covered at several places with corrugated iron, while an "umbrella" covers the skips while traveling along the transporter.

Although this transporter performs a series of operations, the whole of them are controlled by a single rope, and the engineer has but one lever to which to attend. Throughout the whole length of the transporting beam, at intervals of 5 feet, are arranged stops, and the engineer can, if necessary, lock the traveler for lowering or hoisting at any one of these stops. Beyond that, once he has pulled the lever setting the machine in motion, he cannot interfere in any way with the cycle of movements through which the transporter has to go on each occasion. Then the locking of the traveler at any of the stops is easily accomplished. When the traveler has passed the desired stop, it is simply pulled up and allowed to run back, when it locks itself automatically at the stop.

The series of movements through which the transporter passes, once the lever has been pulled over by the engineer, are as follows: The skip which has been filled and is attached to the suspended chain is raised by the engineer hauling in the single rope which governs the whole operations until it comes into contact with the traveler, when it strikes a lock, which secures it rigidly to the traveler, and now both the traveler and skip move together. By now paying out the rope the traveler and skip run down the beam, and on reaching the end the contact automatically releases the lock securing the skip to the traveler, so that the skip descends to the desired point. Should, however, the engineer haul on the rope while the skip is in midair, it will automatically tip, and continued hauling in will cause the skip to rise once more, until it is again locked to the traveler, when both move along the beam as before, until the desired stop is reached, when contact once more releases the skip from the traveler, and it immediately descends, to be loaded once more.

The most salient characteristic of this transporter is the self-tipping device. The majority of such appliances require the bucket to come into contact with some heap or



PHOSPHATE TRANSPORTER AT SFAX, CARRYING THE PHOSPHATE FROM STORES AND WAGONS TO VESSELS.

other stop, but in this particular invention no such concussion is necessary, and the skip can be overturned at any point in the air.

In these transporters erected at Sfax, in order to prevent the transporting beam colliding with the masts and rigging of vessels the ends are hinged, so that if necessary they can be hauled up out of the way.

THE DAMAGE TO THE "OREGON."

Since the "Oregon" grounded in the Gulf of Pechili, on a submerged rock, a technical description of the injuries to the ship has been awaited with interest. In our issue of September 1 we gave an account of an eyewitness of the salvage operations, and we now publish some engravings showing the extent of the damage. A cable message from Kure dated August 29, 1900, is published verbatim below as it was received at Washington: "'Oregon,' outside plating frame fourteen to nineteen strake A port to B starboard indentation maximum depth eighteen inches plating not pierced frame eighteen to twenty-five port strake A B extending into A starboard and larboard aft indentation maximum depth twenty-four inches plating pierced over much of area up frame twenty-four and driven almost to inner bottom about twenty. Minor indentations on fore body forward frame fifty-five most serious keel frame ten to eleven twelve to fourteen three inches maximum depth strakes C D port frame twenty-four depth three one-half inches keel and larboard frame twenty-seven to thirty depth five inches strakes A B port frame twenty-seven to thirty depth four one-half inches strakes C D starboard frames forty-four to forty-five depth three one-half inches other indentations maximum depth one-half inch to two one-half inches some butts rivets started plating scored in places bilge keel starboard buckled two places inner bottom port side buckler frames eighteen to twenty-four over first longitudinal calking rivets started in places structural part longitudinals vertical keel floors frame eleven to thirty near indentations generally distorted some badly lower ends frames fifteen, sixteen, seventeen and floors and longitudinals frame eighteen to twenty-five port side to third longitudinal crushed vertical keel buckled places frames twenty-nine forward cellulose framing over minor indentations buckled varying extent lower plated bulkheads eighteen twenty-two buckled bulkheads fourteen twenty-nine and four and aft near frame thirty-two slightly buckled protective deck beams fifteen sixteen buckled at tops hold stanchions door frame slightly distorted bulkhead twenty-two pump room fire rooms fire room floor forward slightly bent six-inch branch main drain two suctions secondary drain broken certain drainage valve seats sea suction slightly distorted woodwork holds slightly damaged estimate cost permanent repairs twenty-five thousand time one hundred days home card damaged part frame fourteen nineteen and eighteen twenty-five first mentioned undergoing temporary repairs other places being calked riveted in view large cost and long time dock permanent repairs recommended completion of temporary repairs as now going on strengthening shoring weakened part structure building to ship's frame with wood covered with plating spaces to inner bottom filled cement watertight and structural work elsewhere to be carefully gone over far as practicable drain pipes doors valves over-overhauled."

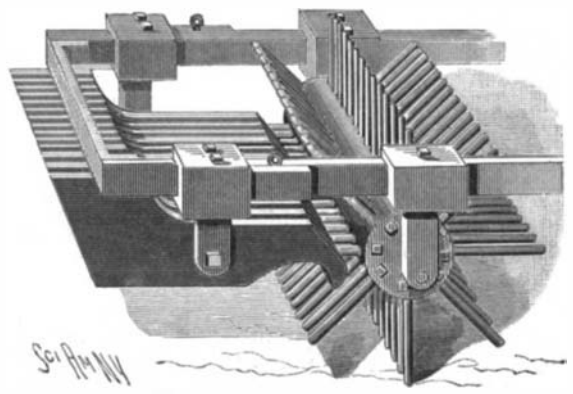
It is possible that the Navy Department will soon issue an amplification of this cable message illustrated by diagrams.

Two logs of African mahogany from one tree have been sold in Liverpool for $7,680.

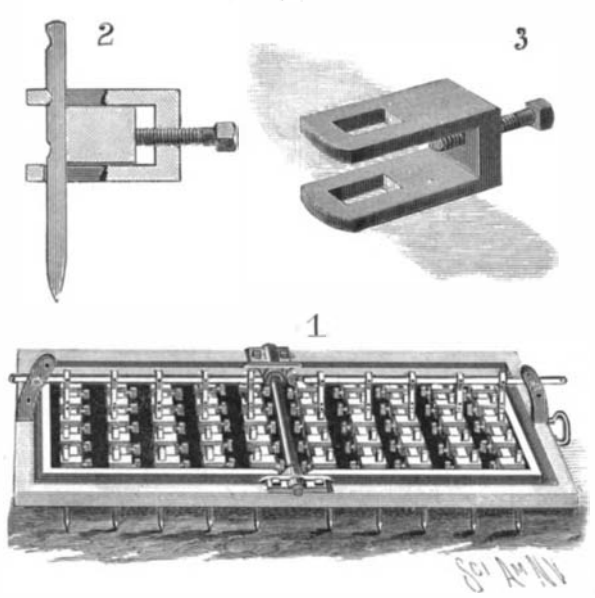
TWO NOVEL HARROWS.

Several harrows have been invented by Mr. William M. Baker, of Fortville, Ind., which are of such improved construction that we have selected for illustration from their number two which may be of some interest to our readers.

The first of our engravings represents part of a rotary harrow provided with a novel cleaning device. As a substitute for the rear roller usually found in such machines, Mr. Baker employs a series of blades, each of which has a hooked forward end intercurrent with the teeth of the preceding roller. The downward and rearward inclination of the forward edges of the blades serves to direct the trash to the rear; while the upwardly and rearwardly inclined edges of the blades cause any trash which might be carried up between adjacent hooks to pass downward. The hooks likewise serve to pulverize the soil.



BAKER ROLLER HARROW.



DOUBLE HARROW AND TOOTH CLAMP.

The second of our engravings represents a double harrow, the teeth of which are adjustably held in a simple clamp. The two harrow frames constituting the implement are located within a main frame, and are provided with supporting-bars journaled in the sides of the harrow-frames. The trunnions of the innermost supporting-bar of each harrow-frame enter the winged hubs of a shaft centrally mounted in the main frame. Thus a very simple method is provided for independently pivoting each harrow-frame in the main frame.

In order that the supporting-bar may not be weakened, the teeth are adjustably screwed in clamps of the form shown in Figs. 2 and 3. The shank of each tooth is notched. The upper and lower members of the clamps are formed with slots of unequal length, so that the forward wall of the upper slot will engage a notch in the tooth when the plain forward surface of the tooth is in engagement with the forward wall of the lower slot (Fig. 2). The teeth are firmly held in place by set screws.

The central teeth on the supporting-bars, as shown in Fig. 1, are provided with arms connected by a shifting-bar. Standards on the main frame receive and guide each shifting-bar, the standards being provided with apertures adapted to register with apertures in the outer ends of the shifting-bars. By means of these shifting-bars, the harrow-frames can be readily adjusted up or down, and the teeth be given any desired angle. The shifting-bars are secured in adjusted position to the standards by passing pins through registering apertures.

The World's Shipping.

Lloyd's Register, the new edition of which has just appeared, gives as usual, a vast amount of valuable statistics relating to the mercantile marine of the entire world. There are now 28,422 vessels having a tonnage of 29,043,728. Great Britain has 10,838 vessels and her tonnage is 14,261,254. From this it will be seen that the numerical proportion of British ships is not so great as is the case with some other countries, because the greater part of her ships are of larger size than those of other countries, and more of them are steam vessels. It is gratifying to note that the United States comes next to the British Empire. We have 3,135 vessels, with a tonnage of 2,750,271; Germany has 1,710 vessels having a tonnage of 2,650,033. Then comes Norway with 2,380 vessels with a tonnage of 1,640,812; then France, with 1,214 vessels having a tonnage of 1,350,562, and Italy with 1,176 vessels having a tonnage of 983,655; Sweden has a greater number of vessels than France, having 1,433, but as the vessels are smaller, the tonnage is only 637,272. Japan has 1,066 vessels, the tonnage being 574,557; Holland, 406 vessels with a tonnage of 530,277; Denmark has 802 vessels with a tonnage of 519,011; Austria-Hungary, 270 vessels with a tonnage of 416,084. Greece, Brazil, Belgium, Portugal and Chile all have a tonnage in excess of 100,000. The steam tonnage of the British merchant navy is superior to that of all other countries combined, but nearly half of the tonnage of the United States is made up of sailing vessels. Great Britain has more than 1,600 steamers of 3,000 tons and upward. Germany has 127 of the same size; the United States 120, and France 60. Great Britain now has 24 steamers with a register of 10,000 tons or more.

Bees as Poachers.

A very interesting case has originated at Warwick, N. Y., and if the decision is sustained on appeal, a most important precedent will be established. Bees owned by one person punctured the peaches of another while they were ripening, extracting the juice from the fruit, thus destroying it. The plaintiff placed his damages at $250.

Local experts gave testimony in both peach growing and bee keeping. The justice gave judgment to the plaintiff to the amount of $25 and costs. If the case is sustained, it will render the owners of the bees liable in damages for their incursion on the premises of other property holders, the same as horses, pigs, and other trespassers. A few years ago a suit was brought in Delaware County against a farmer to recover on a claim for pasturing bees. The plaintiff alleged that the bees had no right to obtain sustenance and material for making honey for the benefit of the owners from his property without compensation. The contention of the plaintiff was sustained and judgment was entered.

View from Port and Underneath, Showing Injury to Keel between Frames 14 and 19. Kure, July 25, 1900.

View from Port, Showing Temporary Patches Put on by Diver over Injuries between Frames 19 and 24.

INJURY TO UNITED STATES BATTLESHIP "OREGON."

THE MARÉORAMA AT THE PARIS EXPOSITION.

The amusement section of the Paris Exposition has occupied the serious attention of some of the cleverest mechanics Europe has produced. At many places in the Champ de Mars and Trocadéro sections are panoramas and side shows of all kinds which vary greatly in merit. Some of them are highly interesting even from a scientific point of view. The Maréorama is one of the most attractive of the many panoramas, and is located on the Champ de Mars near the Quai. Here the spectator may enjoy a trip in the Mediterranean from Marseilles to Constantinople, touching Algiers, Sfax, Naples and Venice on the deck of a steamer worked by a contrivance which causes it to roll and pitch as at sea. Nothing is wanting to complete the deception. There are smoking funnels, steam whistles, etc., while varied scenes of sea and shore pass in review as the spectator steams along the coast. He experiences the zigzag lightning and the crashing thunder of the tempest; he views the sunrise, and later sees a night effect.

The Maréorama has required the exercise of peculiar mechanical talents of a high order. In its construction two problems had to be solved: first, that of effecting the unwinding of two canvases each 2,460 feet long and 42½ feet high, and also giving a double swinging motion to the platform carrying the spectator. The problem was at last finally solved in a very ingenious manner by M. Hugo d'Alesi, a painter who has made a specialty of painting well-colored and realistic landscapes for railway and steamship companies' advertisements. He is also well known as a poster artist. Many decorative and scene painters worked under his direction for eight months to transfer his sketches to the 215,000 square feet of canvas which is unwound for the spectator. The visitor to the Maréorama stands on the deck of a ship, which is made to pitch and roll mechanically. The wind whistles in the rigging as it grows to a tempest. As the voyage progresses, the rocking of the ship becomes more violent, there is the usual sound of the screw and of the steam siren. Even the smell of tar is detectable. To add to the illusion, deck hands are hurrying about the deck, ostensibly to help any who may suffer from *mal de mer*.

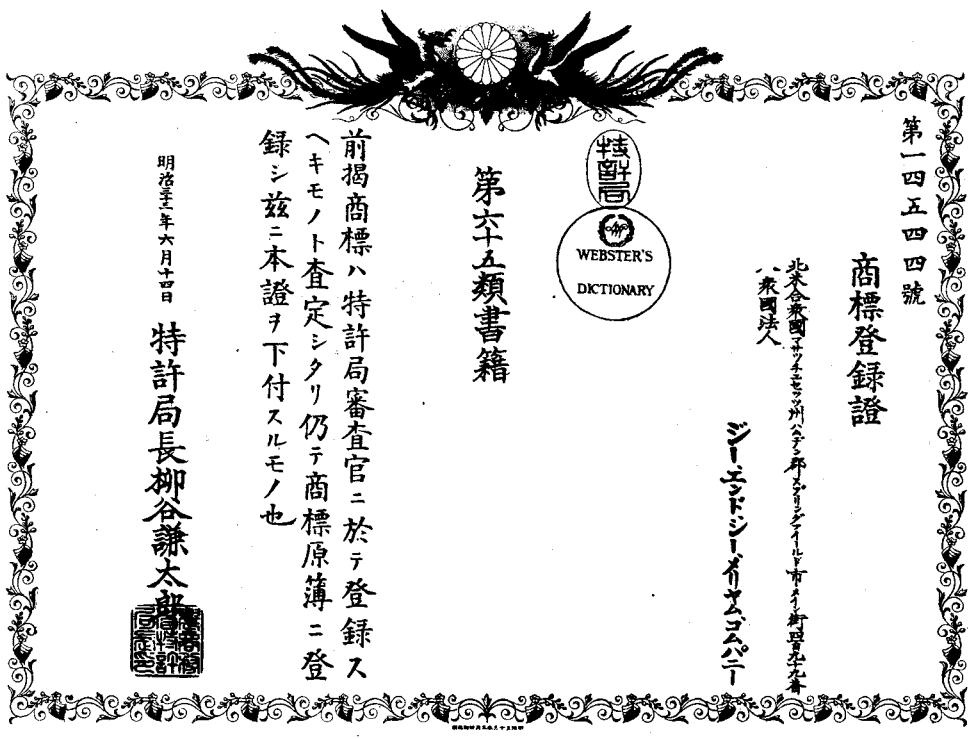
One of the canvases unwinds to the starboard and the other to the port side. Both are wound on cylinders at the ends of the vessel. The latter are concealed by curtains and decorative motives. The same system is used in both canvases. The problem which confronted the builders of the panorama was that the canvases, each of which comprises 107,500 square feet, must be made to pass from one cylinder to the other end of the vessel and be wound on another cylinder. The cylinders being vertical, it was, of course, necessary to sustain the great weight of canvas at various points, in order to prevent it from sagging. M. d'Alesi adopted a very ingenious arrangement for surmounting these difficulties. Each cylinder ends at the top in a truncated cone, of which the large base points upward, and upon the entire surface of which are arranged hooks according to a helicoidal curve.

The cylinders are supported by floats, which permit them to move in a vertical direction a distance equal to the height of the truncated cone. They are revolved by hydraulic motors situated at the very top of the construction. The upper edge of the canvas is reinforced with a thin band of steel, containing apertures at regular distances, which are adapted to engage hooks attached to short horizontal iron rods, secured to the lower extremity of small trolleys, which are connected with each other and which run upon a rail. The housings of the trolley wheels are connected at the top by rods, so that when the mechanism is started one trolley wheel follows the other on the rail at a foreordained distance, thus carrying the canvas with it. Yokes are attached to the superstructure which carries the rail, and at the bottom of the yokes are rollers which are adapted to press the canvas into contact with the hooks secured to the trolley. The result is that a positive motion is imparted to the canvas without any danger of the canvas slipping or sagging. At the beginning it is unwound for the entire length of the vessel, and the steel band at the top is engaged with the first hook at the small base of the cone of the winding cylinder. When the latter is set in motion by the hydraulic motor, the band detaches itself from the nearest trolley hook, and the apertures with which it is provided present themselves opposite the hooks of the cone, our small inset diagram showing the path of the canvas, the trolleys moving in a curve as they approach the cone. As the canvas winds by the ingenious mechanism, its weight causes the sinking of the float that carries the cylinder, and the hooks of the cone situated at different points present themselves in succession at the level of the point at which the steel band detaches itself from the hooks of the carriages of the trolleys. Naturally the adjustment of each of the hooks to the winding drum, or cone, was a delicate piece of work, because the exact point was dependent upon the weight of the canvas, and as the latter is not entirely homogeneous, its weight is not the same at all points. It varies likewise with the size of the painting. These differences were corrected by weighting the lower edge with small plates of lead placed in pockets. After the apparatus was once adjusted, there was no further difficulty.

The spectator stands upon a platform which represents the deck of a transatlantic steamer. In order to give the deck on which the visitor stands a rolling and pitching motion, the well-known Cardan suspension system is used.

The vessel proper is mounted centrally upon an iron frame which is 16 feet square, and which is journaled in such a manner as to allow a longitudinal or pitching motion to be imparted to the body of the vessel. The journal rests upon two trunnions, which, in turn, are mounted upon another frame which is journaled at the center in such a manner as to allow a lateral or rocking motion to be imparted to the body of the vessel. The trunnions carrying the lower frame are mounted upon masonry piers. At each end of the platform of the vessel are two pistons which operate in hydraulic cylinders which are connected by means of a conduit. A chain is attached to the extreme end of the main platform of the vessel. By means of this chain the pitching motion may be imparted to the body of the vessel by an electric motor.

By means of a Stephenson link-motion the amplitude of the movement can be varied. For the pitching, it is possible to proceed to a maximum of 20 inches on each side of the horizontal plane, say 40 inches of the total displacement for the extremities. For the rolling, it is possible to have 8 inches. An electric motor actuates the pumps designed for the hydraulic motors and elevators employed in the construction annexes. Two other and smaller electric motors actuate the sectors that effect the traction upon the chains for the displacement of the platform.



A JAPANESE TRADE MARK FOR WEBSTER'S DICTIONARY.

German Mask Industry.

Paper masks are made by doubling one sheet of a specially prepared paper, wetting it, and moulding it by hand over a face form; it is then dried by artificial heat and cut off of form. Openings are cut for eyes, nose, and mouth, and it is painted and decorated by hand as desired. The paper used by Sonneberg manufacturers is made in Oeslau and Schleusingen, and costs at present about 33 cents per 480 sheets. One sheet makes three of the common masks. The painting of cheap masks costs about 12 cents the gross; the moulding of face costs about 14 cents per gross. Packing is figured at about 3 per cent, as the masks are rolled in brown paper, the ends being folded in to save string. The expenses are estimated at about 15 per cent, leaving the net profit 20 to 22 per cent, as the complete article sells at present at about 42·8 cents per gross. The cash discount varies from 2 to 5 per cent, according to the size of order and reliability of purchaser. Last year the masks sold for about one-third of a cent each, says Consul O. J. D. Hughes, of Coburg, and next year's price is expected to be 43 cents per gross. The cost of raw paper next year, it is estimated, will be higher, and there will be an increase in the cost of painting. The hair used for mustaches, etc., cost last year 15·5 to 17 cents per pound. Manufacturers have no trouble in getting good prices, and are making handsome profits. These calculations are on the cheapest staple goods; on specialties the gain is considerably more.

Wire masks are made by stamping a piece of wire netting about one foot square over a face mould in a large machine, inclosing the rough wire edges in a narrow strip of lead, and painting. The latter is done by hand in oil colors. The prices of these masks have undergone little change during last year, but an increase of about 4·7 cents the dozen is looked for next season. The present selling price of the cheaper masks is 47·6 cents the dozen. The wire is at this date selling for $8.33 per 220 pounds, but this is an extraordinarily low price.

Gauze masks are made by moulding over a clay face form a doubled piece of cheap linen gauze that has previously been soaked in a starchy paste. The sticky linen is made to adhere to the form, and this is set on a stove and dried for about twenty minutes. The linen is then taken off and openings cut for the eyes, mouth, and nostrils. It is painted as desired, and makes one of the most practical masks known. The gauze mask is used considerably in the United States, but the larger portion of them are made therein by machines owned by two firms, one in New York and the other in Findlay, O.

A JAPANESE TRADE MARK.

Of all the patent documents published throughout the world, it is doubtful whether any possess for us a more curious interest than the specifications, copyrights and trade marks issued by the Japanese government. Some idea of the oddity of these papers, with their characteristic script extending after the Japanese fashion up and down the page and the artistic ornamentation not always found in legal documents, is conveyed by the accompanying fac-simile reproduction of a certificate of registration for a trade mark for Webster's Dictionary, obtained through our agency. Translated the paper reads:

CERTIFICATE OF REGISTRATION.

Registration No. 14,544. Class No. 65, Books. Proprietor, G. & C. Merriam Company, 499 Main Street, Springfield, Mass.

The trade mark represented in the fac-simile having been decided by the examiner of the Patent Bureau as permissible of registration, the same has been this day entered in the Register of Trade Marks, with the register number above written, and this certificate hereby issued.

KENTARO YANAGIYA, Director,
Imperial Japanese Patent Bureau.
Tokio, June 14, 1900.

Panama Hats.

The hat for summer wear which is termed "Panama" does not really come from Panama; Ecuador is its real home, but the industry extends to Peru and even to Yucatan. The hat is known all through Latin America as "jipijapa," in honor of the city where its manufacture was first started. It is only outside of the countries which produce it that the hat receives the name of "Panama." In its fabrication the leaf of a small plant is used which grows abundantly in the country. The leaves have the shape of a fan and the plant is known as the Carludovica palmata. In buying one of these hats it is necessary to find out two things: first, if the straw is whole, and second, if it is not stiffened. The weavers split the straw with such perfection that unless the purchaser is accustomed to such examination, it is very difficult to tell the difference between a hat made of whole straw and one made of split straw, although the former is worth several times one of the latter. Good torquilla is white and stiff enough not to need any gum, and only the ordinary hats are treated.

The finest hats ever made were by a native named Palma, and were exhibited at the Paris Exposition when Napoleon III. was Emperor. The best two were bought by a French gentleman for 1,000 francs ($193) and presented to the Emperor and Marshal MacMahon. Palma is now dead, but there are two or three others who possess equal skill.

Monotony in shape has been, perhaps, one of the chief causes why the hats have not been more popular, but if dealers would take up the matter the natives could easily make any style desired. Ladies' hats may be worn a number of successive seasons; cleaned and retrimmed, they appear perfectly new.

THE Astrakhan electric tramway, which has recently been opened, has a single track with a total length of 12½ miles. The boilers for the power house are constructed for naphtha fuel.

Science Notes.

A marble statue of Apollo, with the head in a fine state of preservation, has recently been unearthed near Athens. Its workmanship shows that it belongs to the fifth century B. C.

The city council of Denver is considering a bill for the destruction of germs in railroad cars passing through that city. It calls for the thorough fumigation and disinfection of all sleeping cars passing through Denver. It is thought that this will lessen the chances of contagion.

Captain Cagni, of the "Stella Polaris," the vessel used by the Duke of Abruzzi in his Arctic expedition, confirms the report that the Duke intends to organize a new expedition. He denies the existence of Peterman Land, and he also states there are no islands north of Franz Josef Land.

The determination of the recalescent point of nickel steel has been made by two Americans, Messrs. H. Souther and F. S. Flavel, for the Pope Manufacturing Company. It appears that the recalescent point of 0·25 carbon steel is a little over 1,600° Fah., while that of 0·50 carbon steel is between 1,350° and 1,400°, and that of 5 per cent nickel steel, with 0·25 carbon, is about 1.080° Fah. The recalescent point of pure nickel is 1,112° F. This furnishes an explanation of the supersensitiveness of nickel steel to heat treatment. The proper annealing temperature for the simple carbon steel is, according to Mr. Souther, a full red, while for nickel steel the heat should not be over a "cherry" red.

The meteorological department of the Japanese government, as described by a pamphlet issued by the Tokio Observatory, is a very complete and practically useful organization. It has about 1,000 stations. Electrical, earthquake, and other exceptional phenomena are regularly observed in addition to the usual meteorological observations. All vessels belonging either to the imperial or merchant service which are over 100 tons burden are compelled to make observations at regular intervals six times a day, and the logs are forwarded to the central observatory. There is a regular service of weather telegraphy and storm warnings. The average success of these forecasts is 82 per cent, and of the storm warnings 70 per cent. The present director is Prof. K. Nakamura, of Tokio University.

A new process for the refrigeration of meat has recently been patented by a German firm which is vastly superior to the principle of freezing the meat as is at present generally adopted. A few days ago a vessel arrived in the Mersey from the River Plate with a consignment of meat which had been preserved by this new system. The treatment of preservation is accomplished by sterilized air. At the port of shipment, some bullocks and sheep were placed in a special chamber, the air of which was subsequently freed from all impurities by means of a special process, and the temperature reduced to 20 degrees below freezing point. The chamber was then sealed, and when opened at Liverpool, after a voyage of thirty-four days, the carcasses were found to be in perfect condition. A piece of meat was cut from one animal and cooked, and when tasted was found to be as fresh and as savory as if it had only been killed a few hours. There was a complete absence of the peculiar taste which is such a prominent characteristic of the prevalent process of freezing meat. It is generally regarded in England that this process will revolutionize the freezing and preserving trade.

Mr. Hogarth, the director of the British School at Athens, has recently returned to England, and given an account of his excavations in the Sacred Cave of Zeus among the Cretan Mountains, about 2,000 feet above the level of the sea. This cave is sacred to Zeus, because he is supposed to have been hidden therein by his mother, Rhea, to save him from his father, who was addicted to cannibalism. For several years past discoveries of ancient relics have been made by the natives. Mr. Hogarth therefore determined to systematically explore the cave and for several months past he has been employed in this task making many remarkable discoveries. During the excavations one day, a laborer rested his candle in a little niche, with the immediate result that a scintillating brilliancy was emitted from some object behind it. Examination proved it to be an offering placed there over 3,000 years ago. In other niches of the stalactite pillars were unearthed weapons, needles, and many other similar curios, valuable relics of what had been offered to Zeus. To enable Mr. Hogarth to carry out his work with complete thoroughness, women were employed to explore the cave, since their eyes are sharper than those of the men. They withdrew the treasures from their secret hiding places by small tweezers, and were extremely zealous in the work, for the simple reason that Mr. Hogarth handsomely remunerated them for everything they discovered. So successful have been the researches, that Mr. Hogarth estimates that it will occupy him seven years to study and to classify the antiquities.

Engineering Notes.

The Lehigh Valley Railway is using a system of lettering on its locomotives which indicates the pulling capacity of each class.

Experiments carried on at the University of Illinois show that coal washing removes a considerable percentage of the slate and ash ingredients and 50 per cent of the sulphur, rendering the coal more fit for gas-making and coking.

The contract for the transportation of mail by the Third Avenue Electric Road from the Post Office to the Grand Central Depot will not be renewed. The service hardly pays and there is considerable danger of passengers being struck by the mail car.

An immense dockyard is to be constructed at Antwerp to cope with the exigencies of the rapidly increasing shipping trade of that port. When completed it will cover no less than sixty-seven acres. The scheme has received the financial support of several of the most prominent shipping owners in Germany.

The South Metropolitan Gas Company, of London, has made a trial of American coal, and has found it superior to English coal, as regards the quantity of gas yielded, and also in its illuminating power and the quantity of coke it produces. It is dearer than English coal, but its quality more than makes up for the difference in price. The company used 3,700 tons as a test.

A lamp-post has been introduced in England which combines a fire hydrant, tap and fire-alarm box. The hydrant can be used for fire purposes, filling water carts, and for street flushing, while the small tap can be used by an individual for domestic water supply. There is a water meter and siphon at the bottom, by which the water is shut off from the hydrant, thus preventing it from freezing.

All the English railway companies have now arranged to allow an extra weight of luggage accompanying passengers to be taken free of charge. The free weight of luggage will in future be: For each first-class passenger, 150 pounds; for each second-class passenger, 120 pounds; and for each third-class passenger, 100 pounds; instead of 120 pounds, 100 pounds and 60 pounds respectively.

A machine for hulling rice has been invented by a citizen of Cincinnati. The working part of the machine is a carborundum wheel or cylinder. There are corrugations on the surface, and these are deep and sharp to cut the hull without injuring the kernel. The rice will be fed upon the roll from the hopper above, and a stiff brush will hold the grain to the wheel while the hull is being taken off. A fan will then separate the husks from the grain.

The Atchison, Topeka & Santa Fé Railway is encouraging the sugar beet industry, and a hundred flat cars are now being remodeled to enable them to handle sugar beets economically. The cars will resemble ballast cars, in that six doors will be arranged on each side hinged to a top rail, for side-dumping the beets at the unloading shed at the sugar mills. In order to unload, it will only be necessary to turn the lever, and the doors will open upwardly, and the beets will roll down an inclined plane into the storage bin, says The Railway and Engineering Review.

The Queen of England's new steam yacht is at present undergoing the official steam trials. She has been through her forty-eight hours steaming tests, with complete satisfaction, and a long journey is contemplated, probably to New York and back, to test her sea-going qualities. With a mean indicated horse power of 11,298, which is 298 above the contracted power, the speed attained in her power trial was 20·53 knots, the mean air pressure being 6. Rough weather was encountered at times, but although the yacht rolled a little, she proved herself a good sea boat. The vessel is equipped with the Belleville water tube boilers, which in the trials have proved very successful and quite up to the standard anticipated by the Admiralty. The yacht is being rapidly completed for sea.

The municipal authorities of Leeds, England, have been so defrauded by their tram conductors that they are introducing a novel ticket machine, which will put an effectual stop to the nefarious practices of their employes. The machine registers each passenger and records the fare. It is only 5½ inches square by 1¾ inches deep, yet it performs a whole program of operations. When the passenger tenders his fare to the conductor, the latter takes the ticket from the machine. But as it issues therefrom, the date; the exact time of the day at which the ticket was issued; the stage to which the fare carries; the number of the machine from which it was issued; and an advertisement are printed simultaneously in an instant upon the ticket. The amount of the fare paid by the passenger is also recorded on a dial in front of the machine. The machine also records the total number of pence received during the whole journey and the number of passengers who have paid their fares. By means of this ingenious little contrivance, the dishonesty of the conductor is completely checked.

Electrical Notes.

The Niagara Falls Power Company makes a nominal charge for allowing visitors to see the installation. The receipts go to charity.

In Austria the use of electrical power distribution in mills and factories is becoming widespread and almost universal in the important textile industry. Recently a plant has been installed at Roverado, in the South Tyrol, in which 400 velvet-weaving looms are operated by polyphase electric motors from a central power station. Severe practical tests are said to have shown high efficiency and entirely satisfactory operation.

The omnibus companies whose vehicles traverse the same route followed by the Central Electric Railway, of London, have considerably felt the effects of their new rival. For the second week after its opening the receipts of the London Road Car Company decreased by $6,920, and those of the London General Omnibus Company by no less than $16,463. On the other hand, the receipts of the railway for the same period amounted to $25,210, an increase of $3,595 upon the traffic receipts of the first week, representing an average daily increase of 12,000 passengers.

Electric power transmission is giving a new impetus to industries in the south and east of Europe. At Sinaia, the summer residence of the King of Roumania, a fine water power on the river Prahova has been developed, and its energy will be transmitted forty-five kilometers (twenty-nine miles), and distributed to a number of industries in the lower valley of the river. In the extensive petroleum fields in the neighborhood a considerable demand for current has arisen. A high tension system of distribution is used, the pressure on the main transmission circuits being 11,000 volts.

The penny-in-the-slot system of distributing gas through the poorer and artisan districts of London has been so successful that attempts are now being made to supply the electric light in the same way. The vestry of Battersea have erected a large generation station which is nearly completed, and have laid the necessary cables down in the roads. The fixtures are installed in the house free of cost to the customer, who simply pays for the amount of electricity he consumes. The profit derived from this method of distribution is sufficient to enable the authorities to recoup themselves for the initial cost of the installation of fittings in the houses.

Mr. George Rumker, of the Hamburg Observatory, has been conducting some interesting experiments with a view to measuring the length of a flash of lightning. During a thunderstorm, a few weeks ago, he had set up his camera, and succeeded in recording upon his photographic plate a flash of lightning, which struck a tower about 550 yards distant from his camera. From the distance he was from the tower, and the focal distance of the camera objective, Mr. Rumker succeeded in calculating the breadth of the flash, which was one-fifth of an inch. On each side of the main flash of lightning are seen many ramifications, which Mr. Rumker attributes to the strong gale that was raging at the time, but they have imparted to the discharge the curious effect of a ribbon torn to shreds.

The starting of three-phase induction motors is the object of a recent invention of Herr V. Fischer-Hinnen, of Prague, Austria, says Engineering News. In series with the secondary winding is connected a large non-inductive resistance, which is shunted by a coil having low ohmic resistance, but high self-induction. All that is required to start the motor is to close the switch connecting the primary winding with the mains. The induced currents in the secondary are at the beginning of high frequency, and neither the impedance coil nor the ohmic resistance will allow a very large current to pass. But, as the motor speeds up, the frequency becomes lower and lower and the apparent resistance offered by the impedance coil falls correspondingly, until at full speed it was very small. The presence of the coil has only a slight influence on the normal running of the motor, there being a slight diminution of the power factor and a slight increase in the amount of slip.

The X-rays have been subjected to a novel purpose in Calcutta. A thief was supposed to have stolen a diamond worth 10,000 rupees and to have effectually secreted it on his person by swallowing it. Expert thieves in India temporarily secrete small valuables of this description in the throat. It is called "pouching," and the thieves undergo special training in order to render them proficient in the art. The plan is very simple. A small piece of lead is attached to a thread, and this the neophyte swallows, then by the action of his tongue he guides the lead to the orifice of the sac in the throat. The pupil is prevented from completely swallowing the lead by the piece of thread which the teacher holds. When the man has become skillful in this act of swallowing, the leaden pellet is coated with lime, which has the effect of enlarging the sac so that it becomes capable of retaining large articles. In the case of Calcutta the Roentgen rays revealed the presence of some obstacle in the throat, but its precise identity could not be gathered.

Electric Cooking at Paris Exposition.

One of the most extensive applications of electric cooking is that which has been made at the restaurant in the basement of the Spanish pavilion. The installation which has been made there demonstrates the great advantages of this method and shows that it is adapted to all the requirements of an establishment of this kind. As the Spanish pavilion contains a number of collections of great value, the government authorized the establishment of a restaurant in the basement only on condition that no coal, gas, or petroleum should be used, on account of danger from fire. The electric system was thus almost compulsory; it was, however, quite an undertaking to establish a plant of this kind, as over four hundred meals per day were served, with the complicated menu necessary for a high-class restaurant. The installation was made by Parvillé & Company, of Paris, and is now in successful operation. The outfit consists of a large range, two large broilers, two ovens, a hot water reservoir, a vegetable boiler, and a small heater. The principle of the apparatus consists in the use of a metallo-ceramic resistance, based on the fact that the conductibility of metallic powders is diminished by mixing them with powder of refractory material. On account of the great pressure and high temperature used in making resistance-pieces of this kind, they are very solid and easily handled, and may be raised to incandescence in free air without deterioration. The powder is pressed into different forms, such as pencils, bars, or plates, and any desired resistance may be obtained. The consumption of energy in proportion to the heat given off is within reasonable limits. The pieces are easily replaced without taking apart the apparatus. In the large range, which measures 3 × 6 feet, there are eight fireplaces, each consisting of a group of these resistance-bars, which are raised to a bright red by the current and will support a temperature of 1,200° C. without deteriorating. Four of the fireplaces consume 25 amperes at 100 to 110 volts, and the other four 20 amperes. The heat not utilized by direct radiation is used to heat a series of intermediate plates by which the cooking is finished. The temperature is adjusted to any desired degree by means of a regulator, and any one of the resistance-bars may be cut out when desired. The two broilers give a high temperature, and heat from above, avoiding the falling of fat and the consequent odor; these take a current of 25 to 35 amperes. Of the two ovens, one is arranged to be heated by the lower part and consumes 20 amperes; the second has several heaters placed in the upper part and connected to different circuits, so as to be used independently or together. It roasts every day at least 75 pounds of meat at one operation, taking about 30 amperes. The vegetable-boiler and hot water reservoir have each a capacity of about 60 gallons. For the coffee, tea, etc., a small heater of two fireplaces is used, besides a water bath. The different heaters are constructed of sheet iron, with solid iron corners and braces; they are made with double partition, the interior space being filled with asbestos. This installation has worked very regularly since the first of May, and demonstrates the practicability of electric cooking when applied on a large scale.

Weight of Elephants' Tusks.

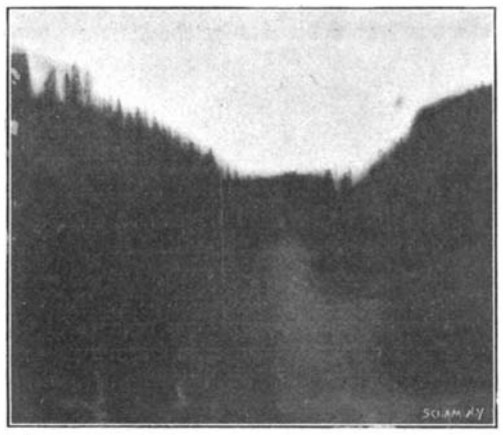
Sir Samuel Baker gives the weights of the largest African elephant tusks he ever saw as 172 and 188 pounds respectively. Tiffany & Company, of New York, have now a pair weighing respectively 224 and 239 pounds. Their corresponding sizes are: Length, 10 feet ¾ inch and 10 feet 3½ inches; circumference, 23 inches and 24½ inches. The tusks of the extinct Elephas ganesa were sometimes 12 feet 4 inches long and 2 feet 3 inches around. A mammoth tusk from Alaska is 12 feet 10 inches long and 22½ inches around, but the average tusks of this animal are 7 feet to 9 feet long and only 60 pounds to 80 pounds in weight. The tusks of the mastodon are thicker than those of the mammoth, a large one being 9 feet 4 inches long and 23 inches around.

H. de Vries records the occurrence, in a culture of Œnothera lamarckiana, of a single individual differing in several distinct points of structure from the parent form, and presenting all the characters of a distinct species. These specific characters were repeated for three generations without exhibiting any tendency to return to the parent form. M. de Vries names the new species Œnothera gigas.—Comptes Rendus.

PENETRATIVE QUALITY OF LIGHT AS TESTED BY PHOTOGRAPHY.

By J. W. Kime, M.D.

Ordinary sunshine falling upon the surface of the body penetrates the tissues to a considerable depth.



NEGATIVE MADE BY RAYS OF LIGHT PASSED THROUGH THE HUMAN BODY.

The condensed actinic rays of the sun pass entirely through the human body.

For the purpose of determining this question a series of experiments have been made by the writer, assisted by Photographer G. I. Hostetler, of Fort Dodge, Iowa, in which we were able to demonstrate that the actinic rays of the sun, when sufficiently concentrated, may be made to pass through the thorax of an adult, from front to back, with sufficient intensity to reproduce a picture upon an ordinary photographic dry plate. The method of procedure was as follows:

The person on whom the experiments were to be

PRINTS FROM NEGATIVE AND POSITIVE TAKEN BY RAYS PASSED THROUGH THE HAND.

made was taken into the photographer's dark room and the plates were applied with great care, that all rays of light save those that traversed the thorax might be excluded.

The direct rays of the sun falling upon the reflector through the skylight are focused upon the chest of the person upon whose back has been placed the sensitized plate on which the picture is to be taken. A transparency on glass of a valley in the Klondike was used as the original from which the picture was to be made. This was fastened to the sensitized plate and the two were placed on the back between the scapulæ of a man weighing 150 pounds, the transparency being placed next to the body with the new plate immediately behind it. Over these were placed black paper, black cotton wadding, several large black cloths, and over this his coat was drawn and all were securely fastened by means of long black bandages. He was then taken to the light room, and the reflector was turned upon the chest for fifteen minutes. After exposure he was again taken to the dark room and the plates were removed, and the illustration shown was developed on the photographic plate.

The upper engraving represents the scene in the Klondike valley.

In producing this picture all sources of error were carefully excluded, and the operation was repeated many times on various persons, and always with like results.

To further test the reliability of the procedure and to insure that the picture was not produced by contact of the transparency with the plate, aided by the body heat or by some undetermined influence other than the light transmitted through the body, plates were arranged in the same manner and for like periods of time, without attempting to pass the light through the body, and no picture developed on the plate.

The middle engraving represents a positive and negative picture of the Mason City and Fort Dodge depot, and, in the back-ground, the Fort Dodge High School building, taken through the hand of the writer, which is more than one inch in thickness.

The same care was here exercised to prevent the entrance of light as above described. Time of exposure, five minutes.

These photographs establish the fact that the actinic rays of the sun, when sufficiently concentrated, may be made to pass entirely through the body of a full grown man.

The rays of light pass through the integument with considerable difficulty, more readily through muscular tissue, and much more readily through bone. In producing a picture through the cheek the light passes through but a single thickness of the skin and the picture is reproduced almost instantly.

The reflector used in making these experiments is a compound circular mirror, 30 inches in diameter, and is overlaid with blue glass.

It is so constructed that all the light which falls upon it is focused upon a spot 6 inches in diameter at a distance of 8 feet in front of it. Thus a very powerful blue light is brought to bear upon the parts.

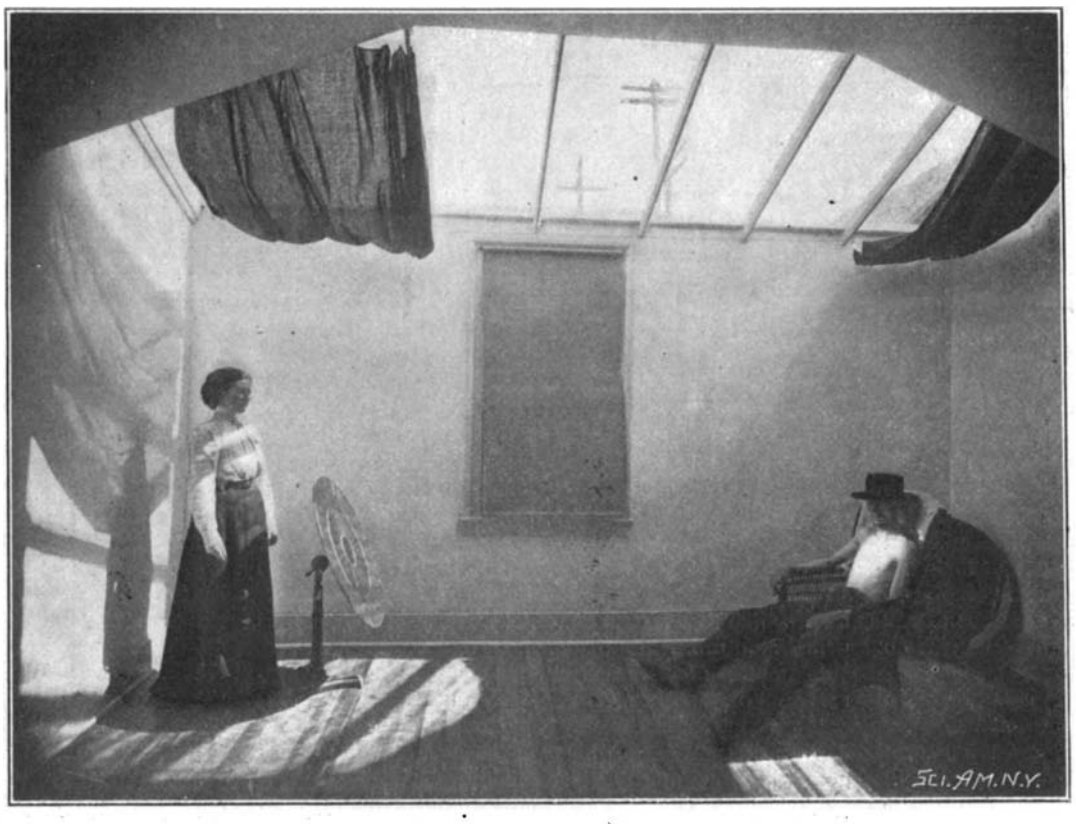
The heat rays of the solar spectrum are largely contained in the red band, while the actinic, or chemic, rays are much more abundant in the violet and ultra-violet bands; thus by utilizing the blue light we get a much greater percentage of actinic light in proportion to the heat rays than if ordinary white light be used.

Heretofore, light has been applied to the treatment of diseases of the skin only, no one supposing that it would penetrate to any distance into the body.

Moldavite.

A curious mineral called moldavite, or bouteillenstein, attracted considerable attention among the geologists in Austria and Bohemia. The mineral is in glassy ovals from an inch to an inch and a half long, and is characterized by various markings, which look somewhat like finger impressions, while others form a network of furrows, which seem in part a rough radial arrangement.

They have been regarded by some authors as relics of prehistoric glass manufacture, but this view does not appear to have been sustained. Dr. Suess, the Austrian geologist, finds resemblances between them and meteorites, and the general disposition of students seems to be to regard them as of extra-terrestrial origin. Resemblances have been pointed out between them and the obsidian volcanic bombs found in Australia. In Bohemia the moldavites occur in sandy deposits, which are assigned to the late tertiary or early diluvial period.



STUDIO, SHOWING METHOD OF MAKING NEGATIVES.

A correspondent from Boston states that the difficulty of forcing a button or shirt stud through a starched buttonhole may be entirely overcome by rubbing the back of the buttonhole with common paraffine wax.

THE NEW ARMY 16-INCH GUN.

The 16-inch rifle is the first of a series of similar gigantic weapons which were proposed for the sea-coast defense of the United States. The Endicott Board, which took the whole subject of sea-coast defense into consideration a few years ago, came to the conclusion that eighteen of these enormous weapons should be made for the protection of New York. The board also recommended that ten 16-inch guns should be mounted at San Francisco, eight at Boston, and four at Hampton Roads. It is not likely that this policy will prevail; for the time being, however, and until others of like caliber be constructed, this gun remains the most powerful piece of ordnance extant.

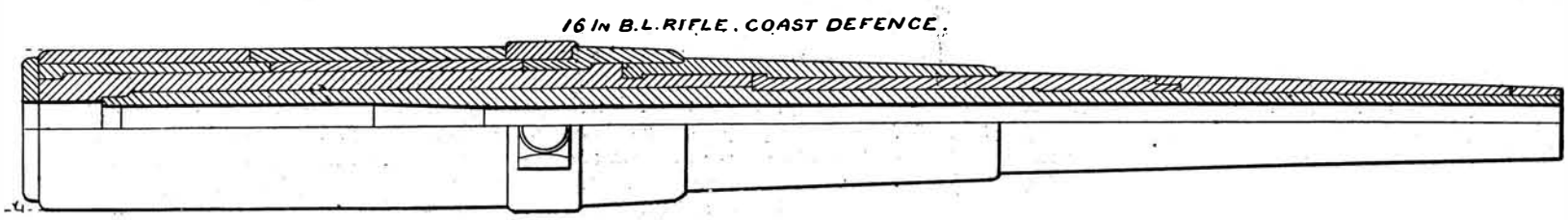


DIAGRAM SHOWING METHOD OF BUILDING UP 16-INCH GUN.

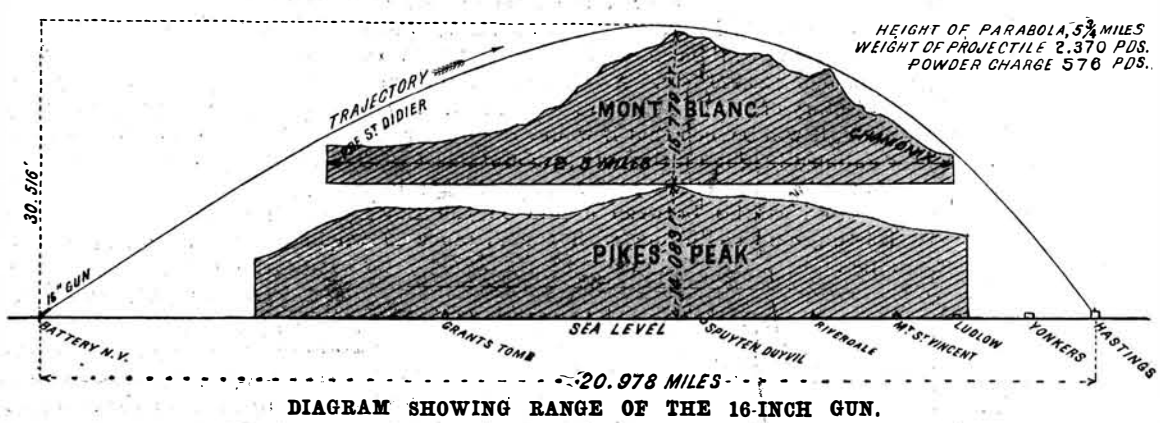


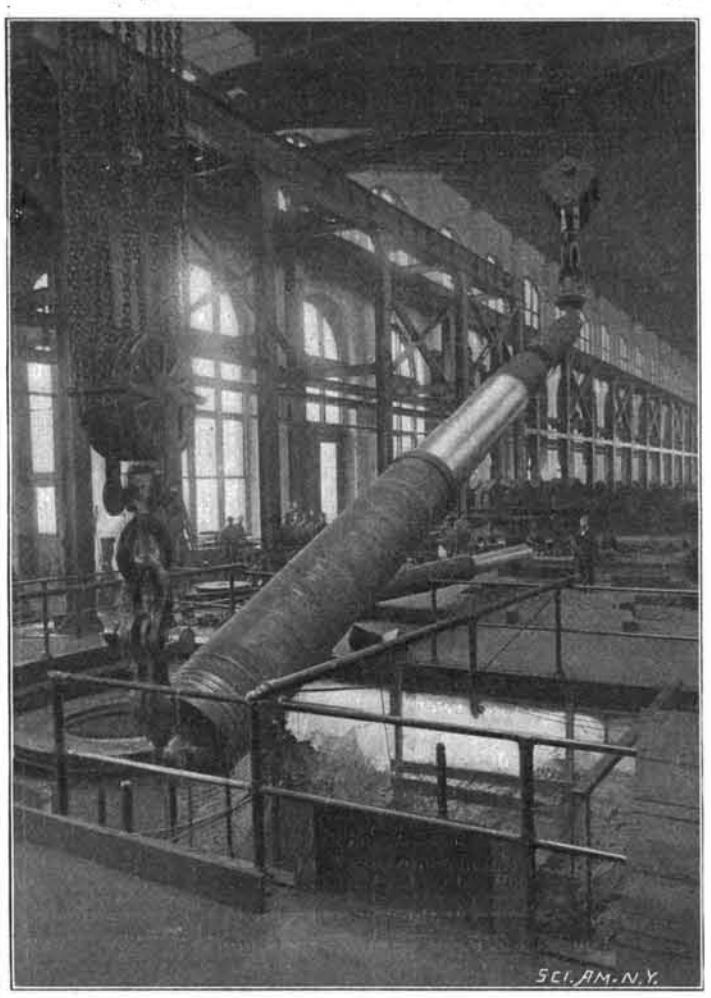
DIAGRAM SHOWING RANGE OF THE 16-INCH GUN.

The range and energy of the gun will, of course, vary with the quality and amount of powder used. Constant experiment is resulting in the production of greatly improved smokeless powders, and the question of the actual performance of the gun can only be determined when the conditions of its trial tests are known. If a charge of powder made from the present army formula were used, the gun would require a powder charge of 576 pounds of smokeless powder, or if the old black powder were used, 1,176 pounds would be required. With a powder pressure in the chamber of between 37,000 and 38,000 pounds to the square inch, it is estimated that the gun would throw a projectile weighing 2,370 pounds with a muzzle velocity of 2,300 feet per second and a muzzle energy of 88,000 foot-tons; but it is likely that by using a slower-burning powder, giving less initial pressure (these being the qualities constantly sought for in the manufacture of smokeless powders), the gun would develop even greater velocity and energy than this, with a relatively small increase in the chamber pressure. Even on the basis given above, however, this gun shows an enormous superiority to any of the large guns above mentioned. The Italian gun, for instance, throws a projectile weighing 2,000 pounds with a muzzle velocity of 1,700 feet per second and an energy of only 40,000 foot-tons, an energy something less than one-half that of the new army gun; the French gun projectile, weighing 1,700 pounds, with a muzzle velocity of 1,700 feet per second had a maximum energy of 36,000 foot-tons; while the English gun projectile, weighing 1,800 pounds, with a muzzle velocity of 2,100 feet per second showed a total energy of 51,000 foot-tons. The maximum energy of the Italian gun was thus 45 per cent, the French gun 41 per cent, and the English gun 65 per cent that of the Watervliet Arsenal gun.

THE 16-INCH GUN IN THE LATHE BEING TURNED TO RECEIVE THE HOOPS OVER THE JACKET.

From the accompanying diagram showing the method of assembling the gun, it will be seen that it does not differ materially, except in the proportion or distribution of its parts, from the average built-up army gun. It consists of a long inner tube; a heavy jacket extending from the breech to about 6 feet beyond the trunnions; the chase hoops, extending from the jacket to the muzzle, and the jacket hoops, inclosing the jacket and extending from the breech for about half the length of the gun. The length of the gun is 49 feet $2\frac{9}{10}$ inches; diameter of breech, 5 feet; of muzzle, 2 feet 4 inches; and the bore is 16 inches. The total weight of the forgings of the gun as received from the steel works was 368,000 pounds. The finished gun will weigh about 300,000 pounds, leaving the amount of steel removed from different parts during manufacture about 68,000 pounds. The projectile of the gun will be 5 feet 4 inches in length, and the penetration in steel at the muzzle corresponding to the energy given above is (De Marre's formula normal impact) 42·3 inches.

JACKET BEING REMOVED FROM THE SHRINKAGE FURNACE.



THE 16-INCH GUN BEING LOWERED INTO THE SHRINKAGE PIT.

By the courtesy of the War Office, under authority given Colonel J. P. Farley of the Ordnance Corps, commanding the Watervliet Arsenal, New York, we are enabled to

present three very interesting photographs showing the gun in the boring lathe, the handling of the jacket preliminary to its being shrunk on to the tube, and the lowering of gun into the shrinkage pit to receive the locking or "D" hoop. At our request, this officer has also furnished us data from published official records relating to the oil and steam furnace and to the operation of the shrinkage of the gun jacket.

"The oil and high pressure steam shrinkage furnace for the 16-inch gun consists of a vertical, cylindrical 13-inch fire-brick wall resting upon solid rock in the southeast corner of the shrinkage pit, the maximum depth of which is 60 feet. Being upon the 30-foot level and 27 feet 9 inches high, the top of the furnace is 2 feet 3 inches below the floor level. Fuel oil is supplied through a 3 inch pipe from a 5,000 gallon tank upon the hill, and enters the furnace through twenty burner openings in five tiers of four burners each. The burner consists of an oil pipe enveloping a small steam pipe, with a small hole at the end of each pipe. The steam, issuing with high velocity through the small opening in the end of the pipe, carries the oil with it as a spray, thus supplying an exceedingly hot flame. The direction in which the burner points may be slightly varied by the bolts and nuts, a form of ball-and-socket joint of limited motion. To prevent the hoops being excessively heated where the flames would impinge, causing unequal expansion and even affecting injuriously the physical properties of the metal, a muffle or cylinder of one-half inch boiler steel surrounds the hoop to be heated, and prevents actual contact of the burning gases with it.

"Operation of Shrinkage of Jacket.—To drill the workmen in handling the jacket, weighing about 74,000 pounds, and especially to drill the cranemen in the operation of lowering the jacket into place on the tube, which operation had to be directed from a position 70 feet below the crane cage, a wooden tube one-tenth inch less in diameter than the bore of the jacket when cold was constructed and placed in position in the shrinkage pit, and for a week two drills per day were held of the entire shrinkage operation. Finally, on March 28, 1900, at 2:30 P. M., the jacket being in the furnace, the burners were started to heat it for shrinkage. The expansions were tried at eight different spots a number of times. During the following day it was allowed to soak in the furnace with intermittent heating during the following night, and on the morning of March 30 its seating on the tube was attempted, but without success; and a week after the first attempt, on April 6, 1900, at 4:30 A. M., the furnace burners were again lighted to heat the jacket. During this heating the jacket was measured to determine its expansion three times, and on April 7 was successfully shrunk in place. This operation took the entire day. An examination commencing at 7:30 A. M. was completed and the jacket returned to the furnace by 8:30 for additional heating at the breech end. It was again removed at 10:30, being out of the furnace at 10:41, measured and in position over the tube at 11:05, centered and started to lower over the tube at 11:16, and in place at 11:23. Preparations had been so made that water was applied to the muzzle end in less than one-half minute after the jacket was in place, and the application of water continued until 8:15 P. M., four water rings being used until about 4 P. M., the number of rings being then reduced to three, and during the last two hours of the cooling to two water rings. So much water was used during the cooling that by about 4 P. M. the lower part of the shrinkage pit was filled with water to a depth of from 25 to 27 feet, notwithstanding the fact that the pit was practically free from water when the operation was commenced and the steam pump was running constantly. This pump continued to run even when submerged by as much as six feet of water, and soon after the number of water rings was reduced to three, the capacity of the pump caused the water to fall rapidly."

The gun without the jacket weighs 102,000 pounds, and the jacket 76,000 pounds.

The difference between the outside radius of the gun itself and the inside radius of the jacket after it was heated was only six one-hundredths (0·06) of an inch. It will be readily understood that to lift the huge mass of steel out of the furnace, swing it over the gun and lower it accurately into position required the greatest care and good judgment. Any inequality in heating, the smallest fragment of an error in measurement, the slightest variation of alinement between the jacket and the tube in the pit, would have ruined the work of many months of careful preparation; for had this jacket stuck fast upon its tube before it was in the correct position, it would have been a problem to puzzle over.

Undoubtedly the most spectacular feature in connection with this gun is its enormous range, which is estimated at about 21 miles, or to be exact, 20·978 miles. This theoretical range has been calculated by Major James M. Ingalls, Fifth United States Artillery, for many years instructor at the Artillery School for officers at Fort Monroe, Va. The firing table for this gun prepared by Major Ingalls shows that the above range is obtainable with a muzzle velocity of 2,300 feet per second, the necessary angle of elevation of the piece being 40°. The trajectory of the projectile shows that in ranging to 20·978 miles the shell would reach the maximum elevation of 30,516 feet. This is enormously greater than the maximum range hitherto obtained by any other gun, which at present stands to the credit of a Krupp 9·45 inch gun, which was fired on the Meppen range, in the presence of the Emperor of Germany, on April 28, 1892. The measured range was found to be 22,120 yards, or roughly speaking, 12½ miles. The greatest height reached by the Krupp shell in its flight was 21,456 feet, and the time occupied between the firing of the gun and the striking of the projectile was 70·2 seconds. It was pointed out that had this gun been placed at Pre St. Didier in the Alps, elevated to 44°, and fired, its shell would have ranged 8,956·8 feet higher than Mt. Blanc, and its fall would have been in the neighborhood of Chamounix on the other side of the range. This performance, great as it was, becomes positively insignificant compared with the capabilities of the new army gun. To show what it could accomplish, we have prepared the accompanying range diagram. In a map of New York and vicinity the gun is supposed to be set up at the Battery. With a radius of 20·978 miles a circle is struck inclosing the territory that would be reached by the projectile of the huge weapon. Pointed to the north, the gun would throw its shells far beyond New Rochelle on the Sound, and Tuckahoe would be easily within range, as would be Hastings-on-the-Hudson. The circle inclosing its zone of fire would pass through Hempstead and Long Beach on Long Island, and its shells would pass far above Sandy Hook and fall half a mile beyond the Atlantic Highlands; Keyport and Perth Amboy would be open to attack, as would Westfield and Millburn in Jersey, while the residents at Orange could hear the huge projectiles roaring high overhead, to fall nearly seven miles distant in the valley beyond; Paterson would be within reach with four miles to spare, and Ridgewood would be an easy mark.

Adopting the method pursued by the German artillerists to give a graphic picture representative of the range, we have prepared the accompanying profile showing Pike's Peak, Colorado, with Mt. Blanc superposed above it, the combined height of the two mountains being 29,926 feet. As the extreme height of the trajectory of the 16-inch gun is 30,516 feet, or above 5¾ miles, it will be seen that it would rise higher than the combined height of these two mountains by 590 feet. On the base line of the profile are marked various well-known localities between a line on the Battery to Hastings-on-the-Hudson, with the distance shown in miles.

New Chemical Reactions.

A series of reactions has been discovered by Mr. P. Cazeneuve by which a very small proportion of some of the metals, even $\frac{1}{100000}$ part, may be detected, the solutions giving a fine blue or violet tint. In the case of chromium, the experimenter claims that a solution of $\frac{1}{1000000}$ part of the metal gives a decided violet color which is quite characteristic. These reactions are obtained by using the diphenylcarbazide, which is transformed by certain metallic salts to diphenylcarbazone, losing two atoms of hydrogen. This action is especially noticed in the case of mercurous, cuprous and ferrous salts, which give a very intense color. The organic compound used as a reagent should be in a pure state; it is obtained thus by crystallizing it in concentrated acetic acid, or even better in acetone, and drying it at 60° C. It is then dissolved in benzine, in which it is slightly soluble. To produce the reaction, the metallic salt in very dilute solution is agitated with the benzine solution, when the characteristic color appears. The copper salt gives a fine violet color, which passes into the benzine; it is not decomposed by agitating it with ferrocyanide of potassium. The mercurous salts give a dark blue tint, and ferrous salts a pinkish color, which becomes brown when agitated with the ferrocyanide. Solutions of $\frac{1}{100000}$ give a strong coloration, and may be thus detected when other reagents fail. The color is destroyed by the addition of mineral or organic acids in excess. The other metals do not produce this reaction, except in the case of gold and silver, which give rose tints with precipitation of the metal. The most remarkable reaction is that of chromium; in the state of chromic acid, $\frac{1}{1000000}$ part of the metal, or even less, is detected, giving a reaction which is not to be confounded with the preceding. It is only necessary to acidify the aqueous solution of chromic acid or chromate with hydrochloric acid, and to add the organic compound in powder in excess, and agitate. A fine violet color is obtained, which is, no doubt, due to the formation of chromated organo-metallic compounds of a basic nature. The reaction is characterized by the fact that it is stable in the presence of excess of acids; it is thus given by no other metal. The color is not taken from the water by benzine, but it will pass into amylic alcohol.

Coal in England.

Now that the question of exporting American coal to Europe, and thus securing the markets that have hitherto been controlled by England, is being so widely discussed in consequence of the high prices demanded by English colliery owners, it is interesting to study the magnitude of England's market for coal upon the Continent. For the first seven months of this year England has exported no less than 26,044,227 tons, an increase of 1,059,655 tons upon the quantity exported for the same period in 1899. The principal purchasers of this aggregate were France, Germany and Italy. The following tables will show what is the present demand in these countries for English coal in comparison with the two previous years:

	1900	1899	1898	
France	4,936,428	3,980,959	3,033,023	tons.
Germany	3,240,808	2,788,747	2,427,826	"
Italy	3,060,715	3,389,509	2,639,014	"

It will thus be seen that, with the exception of Italy, the exports to the principal European markets have increased. In London a little while ago a great outcry was raised against this enormous export of coal, as it was felt that it was only being purchased for the use of the various Continental fleets. To a certain extent this is indubitably true, but at the same time there is a remarkably increasing demand for coal for the European markets. The English colliery owners are making a rich harvest as a result of their enhanced prices. The aggregate amount of coal exported from England for the first seven months last year was valued at $64,610,290, whereas this year the value of the exported coal for the same period is estimated at $104,251,270, an increase of about eighty per cent. Notwithstanding the high increase in prices, the demand is greater than the supply. The English Admiralty are just placing their contracts, which must necessarily run into two or three hundred thousand tons, and many of the large corporations, manufacturers and railway companies are tendering for their annual supply.

Automobile News.

Chicago now has an automobile club, and among its members are enrolled most of the prominent automobilists of the city. It is estimated that there are 400 automobiles in Chicago.

Buffalo has a very active automobile club, the members of which are constantly taking club runs. Owing to the splendidly paved condition of the city, Buffalo affords an additional field for the use of the automobile.

Albert C. Bostwick, of New York, won a 10-mile open automobile championship at the Tri-State Fair at Guttenberg, N. J., September 18. The fastest mile of the championship race was made in 1 minute 27⅘ seconds.

The New England Electric Vehicle Transportation Company is doing considerable business at Boston, having 154 automobile vehicles of various kinds, and about 60 more are to be added for delivery wagon purposes. The mileage since October 2 of last year was 112,000 miles, and between 400 and 500 tons of batteries are handled every day at the station.

A large number of automobiles will be sent through the country as movable headquarters for political orators. With their aid it is possible to hold meetings at places far away from railroads, but which are still accessible by roads. Many people in the rural districts have never seen an automobile, and they would have curiosity enough to turn out to view them.

The experiments with automobiles by the Austrian army in their maneuvers in the Carpathian Mountains have been of a most exacting nature. Twelve automobiles, each of 32 horse power, started from Vienna en route to Taslo in Galicia, 480 miles distant. The road was via the Carpathian Mountains, which, in some instances, involved a climb of 3,250 feet. The hills, as may be naturally supposed in such a mountainous district, were often very steep, an incline in one case attaining a gradient of as much as 1 in 6. The automobile, however, behaved very well throughout the whole of the journey, only occupying thirty-two hours to cover the distance between Vienna and Taslo, which is an average speed of 15 miles per hour.

An attempt is now being made to provide London with motor omnibuses. This improvement is to be accomplished by the Motor Traction Company. At the present moment, there are two petrol-motor buses plying between Oxford Circus and Kensington Gate, but they are not ideal vehicles in which to travel. They are cumbersome and ugly, and create tremendous noise while traveling. Still, the experiments through which these buses have passed have been productive of valuable experience, and several improvements upon them have been made. The type of bus at present under construction will possess all the good features and none of the drawbacks of the experimental vehicles. At present, the cost of these vehicles is $2,000 each, a sum which is rightly considered excessive in view of the imperfections still inherent in the vehicle.

The automobile risk is attracting the attention of underwriters of accident policies in the United States, and the fire hazards are creating considerable interest abroad. Some serious losses have resulted from the destruction of motor carriages. A writer in a foreign insurance journal describes two heavy losses: "A friend of mine, manager of a leading insurance office, issued a policy for £700 upon a motor car, rate two guineas per cent. The owner and his wife were going for a ride, and had just taken their seats, when, before it had even moved, the car became a sheet of flame. No efforts of the groom made any impression on the fire, and in a few minutes nothing was left except a barrow-load of old metal. Fortunately, no one was injured. Five hundred pounds was accepted in settlement of the damage. Again, only recently, a motor car was being driven from Harrogate to Leeds. Half way on the road a pair of nervous horses were met, and the car driver had reason to rapidly apply his brakes, when over went the car into a ditch. The petrol at once fired, and in an instant the whole was a mass of flame. The owner of the vehicle was standing near, an interested spectator, watching his £500 motor consumed. Quite apart from the hazard, nothing could be more unsatisfactory to insure, because upon the slightest accident by fire to a good motor car the whole has generally to be returned to the makers, frequently in Paris; and, what with the monopoly, the delicacy and skill of workmanship necessary, together with the high rates of such labor, etc., the bill generally works out to about the price of an entirely new vehicle."

ABORIGINES OF THE NILGIRIS IN SOUTH INDIA.

The Nilgiris are a group of mountains 6,000 to 8,000 feet high connected with the western ghauts just south of Mysore and are inhabited by five interesting native tribes, of whom four are aboriginal. The fifth tribe is that of the Badagas, so called from Vada, which means north. Three hundred years ago these people came from the north, viz., the Canarese country, after the breaking up of the great kingdom of Viajayanagar and they have maintained the Canarese language and the worship of Siva, which they brought from their northern home. They now number 20,000 and are very conspicuous near the large towns of Coonoor and Ootacamund, where they are the bulk of the day laborers. They have a yellowish clayey complexion like the soil in which they toil.

The lowest of the four aboriginal tribes are the Irulas, who live on the lowest slopes of the hills. They are of the Mongolian type of countenance and sell the produce of the forests to buy grain. They have no marriage ceremony, but each boy chooses a bride for himself when he is old enough.

They worship Vishnu under the name of Rangasami at a prominent peak known as Rangasami's Pillar. Their language is like the Tamil of the south country.

A more conspicuous tribe are the Kurumbas, who live on the higher slopes in hamlets of four or five huts each. The huts are constructed of wattle and mud. They live on roots and game and sell jungle produce. They also make baskets and milk-vessels out of bamboo stems, and play rude instruments at the funerals of the Todas.

Like the Irulas they have no marriage ceremony, but allow the youths to make their own choice, and their widows can remarry.

They are very light, the men averaging only one hundred pounds in weight. "Stupid as a Kurumba" is a native proverb, but it is said they always tell the truth. Their number on the Nilgiris is hardly a thousand, but there are branches of this tribe on the Palani and other ranges further south.

Our engraving shows a group of Kurumba women and children belonging to a branch called Muduvas. The meaning of the name is "back carriers," and they explain it by saying that once one of their women put her child down while she was at work in the jungle and a tiger carried it off. So ever since they have carried their children on their backs, even while at work. The picture shows the small children slung on their mothers' backs. It also shows the profuseness with which the women adorn themselves with rings, bracelets and necklaces. The advance toward civilization is shown by the caps on the boys' heads.

Somewhat more numerous than the Kurumbas of the Nilgiris and much more in evidence are the Kotas, the industrial tribe of the mountains. They live in seven villages, each containing from thirty to sixty huts. The only door of a hut is 46 inches high by 26 inches wide. They keep cattle, but do not milk them. They practice the industrial arts and till the land; their lands being the most fertile spots on the mountains. The women make clay pots on a wheel.

A TODA HEADSMAN, SOUTHERN INDIA.

A Kota may have but one wife, unless that one is barren. Widows may remarry.

While the average weight of the men is only one hundred and five pounds, they are twice as strong as the Badagas. Yet they are despised because they live on carrion, and may not approach a Badaga temple.

Each Kota village has two temples and two priests, who are hereditary. They recognize one god and his wife.

Their possession of the best lands indicates their having come early enough to get first choice, and that, therefore, they must have preceded the Badagas, who are the only other cultivating tribe. It is said that they were originally brought from the plains to work for the Todas.

The Todas, the fifth tribe referred to, are the most singular of all the people on the mountains, and as such have become objects of great curiosity to all visitors to the Nilgiris. One man of them was even taken to the Chicago Exposition. They were formerly hunters and are now buffalo herders.

They have a copper hue and features of the Caucasian type. The women have a more aquiline nose than the men. The average weight of the men is 111 pounds.

They have long hair curled at the ends and the women are careful to keep it in curls, thus differing from most women of India, who think curly hair a misfortune.

They are a lazy set. The men refuse to do anything but herd buffaloes and collect tribute from the Badagas and Kotas; and at the present time they beg from Europeans, who are pauperizing them with constant gifts. The women work a sort of embroidery on clothes with Nilgiri nettles for stitching and English needles. Formerly the Katos made needles for them.

They live in hamlets of five huts each called "munds." Three of these huts are dwellings, one a dairy temple and one a calf stable for buffalo calves.

They have a hundred munds scattered over the mountains. Each dwelling hut has no other opening than the little front door, 32 inches high by 18 inches wide, and one has to crawl in on all fours. These oval pent-shaped huts are of bamboo fastened with rattan and covered with thatch.

They practise polyandry and, to a limited extent, polygamy.

A woman, when married to a man, is the wife of his brother as well, though the marriage ceremony is performed only with the eldest brother. Infanticide was formerly practised with reference to female infants, but the British government put a stop to it.

When a woman salutes a man she raises his feet, one after the other, to her forehead. An old woman, however, may receive this honor from a man.

Todas have games that they play something like "puss in the corner" and "tip-cat."

The dairy temple is the abode of the priest, who only can enter it, and women may not come near it. The priest keeps and milks the sacred buffalo herd.

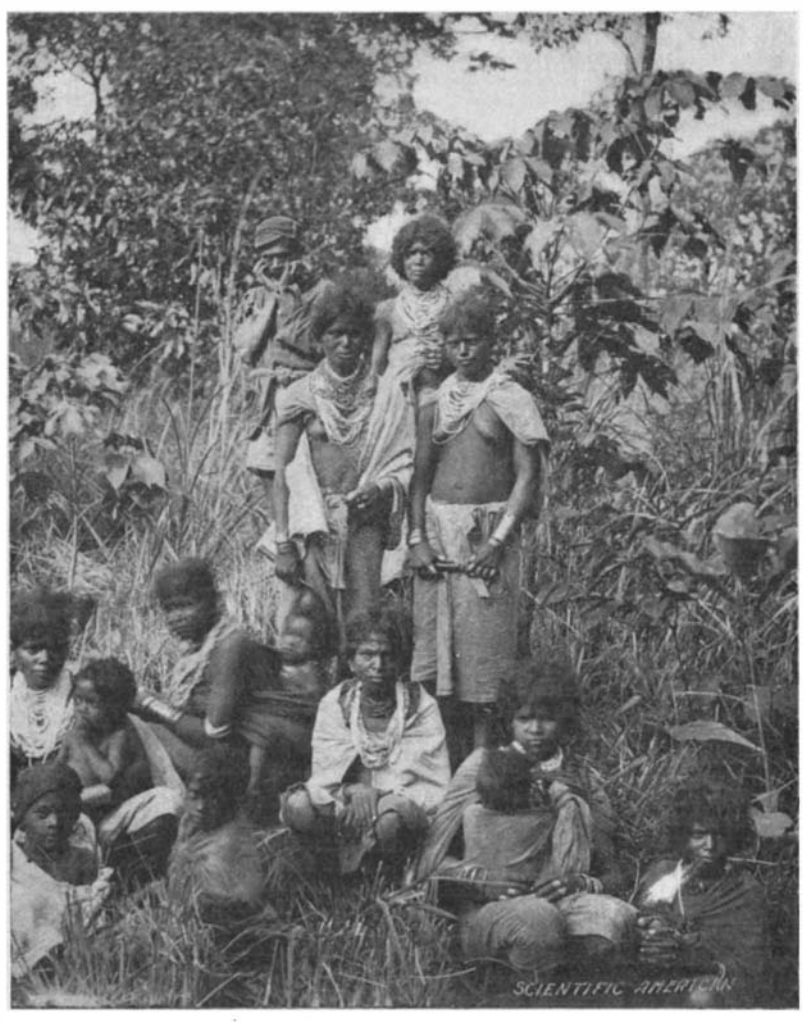
The Todas fear their priest, thinking that God dwells in him and makes known his will through him.

The initiation to the priesthood is very severe. For eight days and nights a candidate must stay alone in the jungle, with no covering on his body and no other protection than that afforded by the juice of a certain tree rubbed on his body. He may retain office as long as he likes, and the usual term is three or four years.

Once a year a buffalo calf is sacrificed. Their worship is mostly buffalo worship. Their songs are in praise of their buffaloes. The only occasion when they are known to have risen higher than their buffaloes in

GROUP OF TODA WOMEN.

A TODA HUT.



KURUMBA WOMEN AND CHILDREN, SOUTHERN INDIA.

song is the time when they composed a song in praise of a missionary lady working among them, on her departure for England on furlough.

When a Toda dies, several buffaloes are slain to accompany him to the other world, and his arm is placed around the horns of one of the slain buffaloes.

They have green funerals and dry ones. The green funeral consists of the burning of the body with its attendant sacrifice of buffaloes and other ceremonies. The ashes are left to the winds.

The dry funeral is one that takes place at the beginning of each year in memory of all who have died the previous year. They gather together in great numbers and slaughter a number of buffaloes and perform many ceremonies. The flesh of the slain buffaloes is given to the Kotas, who furnish the music. The names of the dead are never mentioned again. They think that a string bridge leads to heaven and that hell is a swamp full of leeches. They have no idols, except as they may have borrowed one or two from the Hindoos. Their worship is that of the elements and ancestors and has a pastoral coloring that indicates a Vedic origin. They have no written language, but their lady missionary has introduced the Tamil character to provide books for them.

They number 750. No one has ever been baptized as a Christian. One became a candidate and had prepared himself to arrange his matrimonial affairs in accordance with Christian requirements, but when it came to the loss of his share in the buffaloes of his family, he could not endure that and went back to his heathen life.

The Todas receive tributes of grain from the Kotas and Badagas. If a Badaga refuses tribute, all they do is to prepare to occupy a "mund" near the Badagas' fields. The Badaga would pay much rather than have a herd of buffaloes overrunning his crops, so the tribute is soon forthcoming.

The buffaloes are in a semi-wild state, and have been known to chase cyclists on the roads.

Three of the illustrations show respectively a Toda hut, a Toda man, and a group of Toda women with their embroidery over their knees.

They do not seem to be decreasing, but rather are on the increase. But their constant cry for "elam" (alms) indicates a degeneration of character resulting from the curiosity they excite among all foreigners.

Madura, South India. J. S. CHANDLER.

Home-made Koumiss.

Koumiss is usually prepared by causing cow's milk to ferment by addition of yeast. A far better result is obtained, however, if mare's milk is employed, for this is used by the nomadic tribes of South Russia, who consume koumiss almost exclusively during the summer. The better product is caused by the fact that mare's milk is poorer in caseine and fat than cow's milk and hence much more digestible than the latter. To use cow's milk with advantage for the production of this refreshing beverage, it is well to lessen the percentage of caseine by dilution with water and then to produce a mixture resembling mare's milk by adding sugar. For the preparation of koumiss, it is best to dissolve milk sugar in water and to add the solution in the proportion stated below. Next, rub up pressed yeast with brown sugar with a little of this liquid to a pasty consistency and add this paste to the milk mixture. The liquid obtained is now left to ferment in well closed champagne bottles, the pressing in of the cork being conducted with care, since the quality of the resulting drink is particularly dependent upon the closure. The filled bottles are kept at a moderate temperature for several days for fermentation purposes, shaking them daily for about ten minutes to prevent the caseine from settling. Great care must be exercised in agitating the bottles, since a high pressure is occasioned by the gas generated in the fermentation, and the bottles, not carefully selected for this purpose, are apt to crack, thus causing injuries. Therefore, it is advisable to wrap up the bottles in a cloth while shaking. After a few days the bottle contains a beverage which is valuable as a readily digestible food, especially in the case of stomach troubles, but also as an excellent refreshment for healthy people. For one champagne bottle with one-third water-diluted milk use two teaspoonfuls of white sugar dissolved in a little water, and a little yeast; let the fermentation proceed at about 20° R. (77° F.)—Technische Berichte.

Turkey Orders Warships.

The Turkish government has just placed an order for six cruisers at the German shipbuilding yards at Kiel, and a contract for two torpedo boats, which are nearly completed, has been given to the Ansaldo shipbuilding yard at Genoa.

The Current Supplement.

The current SUPPLEMENT, No. 1291, is of remarkable interest. The first page engraving is devoted to the "Fish River Caves near Sydney, Australia," and is elaborately illustrated. "Inaugural Address," of Sir William Turner, President of the British Association for the Advancement of Science, is commenced in this issue. The third installment of "Mechanical Stoking" is also printed in this number. "The Chinese Army" is a timely article, as is also one on the "Exhibits in the Metallurgical Section of the Paris Exposition." "American Engineering Competition—XI." deals with machine tools. "A New Railway Test Car" is fully illustrated. "Chemical and Technical Education in the United States" is a most interesting and valuable paper, and the first installment is given in this issue.

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RECENTLY PATENTED INVENTIONS.

Electrical Apparatus.

CONDUCTOR AND COLLECTOR FOR ELECTRIC RAILWAYS.—ARTHUR PETZENBÜRGER, Berlin, Germany. A high electromotive force is not allowed by city authorities in the case of overhead or rail conductors because of the danger incurred. It is the object of this new construction to overcome the obstacles presented by this rule. A conductor-casing is used having an elastic strip on each side of its slot, one strip being secured to the casing by springs and the other to the casing by a hinge. The elastic strip undergoes only a slight lateral movement on the collector-arm passing, whereas the second hinged strip is turned back when the collector-arm passes through, being closed afterward by its own weight.

Engineering Improvements.

VALVE GEAR FOR LOCOMOTIVE-ENGINES.—GEORGE B. EDDY, Camden, N. J. The admission and exhaust valves have independent motion, the stroke of the exhaust-valve being fixed and that of the admission-valve variable. A link-motion is actuated by an eccentric mechanism to control the admission-valve. The exhaust-valve is operated from the eccentric mechanism to impart a full stroke to the exhaust-valve irrespective of the position of the eccentric mechanism. As the exhaust-valve has a full throw at all times no back pressure is liable to occur in the cylinder; while the steam is free to expand in the cylinder, as the exhaust does not take place until the piston nears the end of its stroke.

GAS-ENGINE.—WILLIAM E. CARY, Springfield, Vt. This engine is provided with a valve-chamber and a supply-pipe. The admission of the explosive mixture from the supply-pipe to the valve-chamber is controlled by a rotary valve. In the supply-pipe is a throttle-valve on the stem of which a spring-pressed arm is held by one end, the other end being free. This arm can be adjusted along the throttle-valve stem. The governor used comprises two disks on the rotary valve-stem, one of the disks being fixed on the stem and the other mounted to slide on and turn with the stem. Weight-carrying springs connect the disks. On the slidable disk is a cam which is normally out of engagement with the arm on the throttle-valve stem, but which swings the arm when the slidable disk moves toward the other disk. The engine can be started without any adjustment of the valves and stopped simply by switching off the current to the electrodes.

Mechanical Devices.

CHURN.—CHARLES E. YATES, Near Mill Grove, Mo. This operating mechanism for churns consists of a stationary guide on which a cross-head moves, provided with projections adapted to be connected with the dasher-rod and with a loop extending transversely to the guide. A pitman is connected with the cross-head and extends through the loop. Crank mechanism is connected with the pitman. The device enables the dasher to be operated uniformly with small expenditure of power—and therein lies its chief merit.

PITMAN CONNECTION. — DAVID C. LINGENFELTER, Plainview, Neb. The bearings of pitmen of mowing-machines are subjected to much friction and soon become worn so much that the parts must be readjusted to prevent lost motion. The present invention is designed to overcome the difficulty. Keys of graduated widths are used which are successively inserted as the wear increases. In every case the key not only prevents the adjacent edges of the bushing from being brought too near together, so that the bushing cannot be clamped too tightly upon the wrist-pin, but also forms a continuation of the smooth friction-surface required for the interior of the bushing, thereby performing two functions simultaneously.

SAW-SHARPENING MACHINE. — GRANVILLE BARTLETT, Station C, Detroit, Mich. The machine is of that form in which the saw is held in a clamp, and the filing-bar, with file, is reciprocated in guides across the edge of the saw. In the present case a clamp is employed, composed of three separate parts having two spaces for receiving and clamping the saw in different planes. Bolts pass through the three parts of the clamp, and a movable file-carriage with guides receives a reciprocating file-bar. Not only is a full movement secured for the file, but there is no obstruction to a full view of the saw-teeth.

Vehicles and Their Accessories.

VEHICLE AIR-BRAKE.—WILLIAM J. DONALDSON, JR., Avenue Hotel, Galveston, Tex. The inventor has devised an air-brake which is especially adapted to bicycles, tricycles, and similar vehicles. The merits are a great ease of application; a powerful application of the brake; a quick release; and an accurate regulation of the force of the brake. The device can be applied to any ordinary bicycle, without marring the appearance of the wheel.

AUTOMOBILE. — WILLIAM O. BARNES, Stamford, Conn. Mr. Barnes has devised an automobile in which the propelling power is distributed from the motor to the four wheels, or to the rear wheels, or to the two front wheels, a gear being provided by means of which the vehicle can be readily and easily steered, when the front wheels are used as driving-wheels. The running-gear is so constructed that the driving-wheels, front and rear, are spread apart from the ground upward. One of the novel features of the invention is the use of a tubular stub-axle carrying a drive-shaft, and provided with an inclined hinge, the axis of which intersects the ground in the plane of the wheel. The inclination of the hinge is such that the weight of the wagon will create a tendency to straight running.

Optical Instruments.

PHOTOGRAPHIC CAMERA. — JACOB SCHAUB, Logan, Utah. The invention relates to improvements especially applicable to cameras of the multiplying type, whereby the size of the field covered by the camera in changing from one exposure to the next is equal only to the size of the sensitive plate. The camera has simple and efficient means for projecting the sensitive-plate support or frame away from the carriage in which it is mounted and for reciprocating the carriage laterally on the base of the camera. An improved device is provided for confining the light-rays to the size of the "cut-out" or mask. A glass frame is so arranged that the operation of inserting and removing the plate-holders or ground glass will not jar the camera.

LENS.—ROBERT D. GRAY, Manhattan, New York city. Each element of a photographic objective consists usually of a convex lens of crown glass and a concave lens of flint glass of higher refractive index. In order to overcome the spherical and oblique aberration which increases in this combination with an increase of effective aperture, Mr. Gray constructs each element with a convex lens of higher refractive index than that of the concave lens. Besides reducing the spherical aberration, the combination relatively lengthens the focus of those rays which pass through the latitudinal section of the lenses, thereby reducing astigmatism to a minimum.

Miscellaneous Inventions.

FISHING-FLOAT.—LORENZO P. GIBSON, Little Rock, Ark. This float effectively maintains an upright position in the water without dependence upon the tug of the line at the lower end of the float, by which arrangement the lower portion of the line can be left entirely free, without a sinker of any sort, if such arrangement be desired, and yet maintain the float in vertical position.

INHALER.—PETER T. DONOVAN, Manhattan, New York city. The inhaler consists of a wire-body having spring-clamps at its upper portion adapted for engagement with opposite sides of the cartilage of the nostrils. Receptacles supported at each side of the body below the clamps are designed to contain an absorbent material for healing agents. The inhaler is to be used for the treatment of catarrh, asthma, bronchitis, and like ailments, and is to be worn particularly at night.

BED-COUCH. — JOHN THOMPSON, Brooklyn, New York city. The subject of this patent is a combined couch and bed which can be quickly and easily changed from a couch to a bed of a desired width and is readily changed from bed to couch form. The couch comprises end frames on which side extensions are mounted to swing. When it is desired to convert the couch into a bed, one or both of the side extensions are raised, depending upon the width desired for the bed.

PROCESS OF CURING AND SMOKING FISH.—HORACE E. KIRBY, Rock Bay, British Columbia, Canada. The fish after being carefully cleaned and sliced into cutlets, cured with sugar (without the addition of water), and thoroughly washed and allowed to drain, are hung on nails driven into long sticks; and these sticks are hung up in the smoke-house, which is an ordinary building made of rough timber and tightly battened up. The process is said to be cheaper than any which has been heretofore used.

SHOE-STRETCHER.—CHARLES W. CROZIER, Manhattan, New York city. By means of this stretcher a shoe can be simultaneously stretched at the sides, toe, and instep, or the toe and instep can be stretched without stretching the sides.

DRAFT-DEVICE. — JOHN COMMISKY, Manhattan, New York city. A series of hoods of special form are arranged to form a complete circle around the stack, partitions dividing each hood longitudinally into two compartments communicating at the top. Draft-pipes in the stack communicate with the interior of the hoods. The top and bottom plates of the hoods are curved to reduce the frictional resistance to the wind passage. By means of the partitions, the wind is caught in each hood in whatever direction the wind may blow.

DRAWER-EQUALIZER. — WILLIAM BEEBE. The purpose of this invention is to provide means for equalizing the movement of drawers in furniture for the sake of securing uniform movement and preventing binding. The under surface of each drawer is provided with racks which mesh with pinions connected by a common shaft. The racks can be formed in any desired length and subsequently cut off to suit the size of the drawer.

PRINTING-PRESS ATTACHMENT.—MAX SNYDER, Beatty, Penn. The inventor has devised a frame for placing the forms in position on upright or job-printing presses. Heretofore the task has been one of considerable difficulty. The present invention enables the form first to be placed on the platen and held there by hand. Then by driving the press sufficiently the form can be engaged directly with the form-holder to be held thereby.

CEMENT-CURB MOLD.—CHRISTOPHER H. WATSON, Riverside, Cal. In forming cement or concrete-curbs, it is customary to form a mold of the exact size of the curb desired and then to tamp this with the concrete or cement mixture and leave the mold in place until the mixture has hardened sufficiently to retain its shape. The mold is then removed and taken to another point in the curb, where it is again used. These cement-curbs are usually formed in place, for which reason it is desirable to have a device which can be readily moved and adjusted to different curves. For this purpose the inventor employs an arrangement comprising a framework or yokes, with retaining-plates mounted thereon to slide toward and from each other. The plates are operated by cams journaled upon the yokes.

PRINTING-STAMP.—JOHN W. ADAMS, Pinebluff, N. C. The invention provides a printing-stamp with rubber type, having a great number of printing data assembled in compact form and so arranged that any line of printing matter can be quickly brought into position to make an impression, thus obviating the employment of a number of stamps on independent holders and in racks. The device is particularly useful in banks, offices, and the like, where the saving of time is to be taken into consideration.

SKATE.—HUGO HANDWERK, Brooklyn, New York city. This skate has four independent runners arranged in connected pairs—two at the heel and two at the toe. Each pair of runners has more or less elastic connection with the body portion of the skate; and each runner may be conveniently removed at any time and replaced. The construction gives the skater better purchase on the ice, particularly in long-distance skating.

BED-PAN.—HARRIET D. GOODRICH, Augusta, Ga. The purpose of the invention is to do away with the unpleasantness and discomfort of the patient's lying on the back in contact with so much cold surface. The device is constructed with due regard to sanitary principles.

Designs.

BADGE.—CARL F. KABISCH Manhattan, New York city. The leading feature of the design consists of a shell within which is a pebble. A beach scene is painted on the shell.

HEEL FOR BOOTS OR SHOES.—JOSEPH PETRONE, Manhattan, New York city. The heel is vertically fluted or channeled to add to the appearance of the shoe.

BINDER-TAB.—FRANK TAFT, Brooklyn, New York city. The binder-tab is a simple, ingenious device for securely binding together all kinds of sheets.

LINK CUFF-HOLDER. — GEORGE KALKBRENNER, Manhattan, New York city. The holder is designed securely to connect the cuff with the cuff-button, a hook being provided to engage a button-hole of the cuff and a loop to engage the button.

NOZZLE.—WILLIAM H. DEWAR, Manhattan, New York city. The designer has provided a simple device for use on public drinking-fountains, to prevent infection from contagious diseases, by doing away with the uncleanly cups generally used. A stream of water is caused to flow into the mouth from a nozzle, a guard being provided to prevent the mouth from coming in contact with the nozzle.

GAME-BOARD.—EDMUND F. HAWKINS, Yaphank, N. Y. The game is played by shooting a ball through one of a number of arches so that, if possible, it shall strike one of a number of posts or a bell suspended in the line of the longitudinal axis of the board.

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Notes & Queries

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(7967) I. W. C. asks: Can a ball (steel or any other kind) be made so round, and some flat surface made so smooth, that there will be no friction caused by the ball rolling over the smooth surface; or would there be friction by their not being perfectly round or smooth? A. Friction cannot be entirely eliminated in rolling bodies, however apparently perfect the surface of ball and plane may be made, but it may be made so small as to be practically immeasurable and less than the air friction on the surface of such rolling bodies.

(7968) G. W. R. asks: 1. An armature coil as in SUPPLEMENT, No. 641, but with only eight coils each having 34 convolutions of No. 18 B. S. single cotton-covered magnet wire, about 15 feet of wire in each coil, would it work all right wound this way? A. There is no reason why the motor should not work all right, but there is no reason also why it should not give you less power. You reduce the magnetic force by reducing the number of turns on the armature. 2. Would it make any difference if the coils are not exactly the same distance apart? A. No great difference. They should however be equally spaced. 3. How much wire must be wound on magnet core, the same as in SUPPLEMENT, No. 641, and what size wire? A. Wind as described in SUPPLEMENT, No. 641. You would better rewind your armature if you want a motor like the one described in SUPPLEMENT. We have to say a great many times, do not change the printed designs. It is not likely that the change will be an improvement. The designs were made by men of experience and skill, and are right as they are. Any change is likely to result in a reduction of efficiency. 4. Is single cotton-covered wire the best for motor, or is the double the best for motor? A. Single covered wire is good enough for use in a motor to be run with eight cells of battery. 5. Is a commutator with eight segmental parts 5/6 inch diameter, 7/8 inch wide, large enough for the above motor? A. A commutator with eight segments and eight coils of the same size as when twelve segments are used has only two-thirds as many turns as in the original design, and therefore only two-thirds as much power is produced at the armature. 6. What does this mean—30 ampere hours on battery? A. Thirty ampere hours means one ampere working thirty hours, or any number of amperes which the current has working long enough to give thirty when the amperes and the time are multiplied together. The battery for this motor will give perhaps five amperes at best working strength. Five multiplied by six gives thirty. The battery will in such a case be exhausted in six hours. 7. What horse power would this motor be? The armature and magnet core are the same as in SUPPLEMENT, No. 641. A. The horse power is determined as follows: Eight cells of the battery have about sixteen volts. If they are drawn upon to the rate of five amperes, the output is 16×5=80 watts. Now 746 watts are one electrical horse power. The battery will yield about one-tenth of a horse power for six hours.

(7969) W. E. H. asks: 1. How could I make a liquid air motor at a moderate cost? A. We do not know, since no such a thing has been put upon the market as a liquid air motor at moderate cost. 2. Where will I find a description of the same? A. Apply to the Liquid Air Companies which advertise that they have such a motor. 3. Where will I find a description of how to make the apparatus with which to make liquid air? A. In Sloane's "Liquid Air," price $2.50 by mail. 4. How many horse power would you think it would take to run a sixteen foot row boat? A. 1½ to 2 horse power is required for a 16-foot boat. 5. Where would I find a description for making one of that number horse power? A. We know of no description of a liquid air motor. An illustrated description of how to build a 16-foot boat is contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 36. Ten cents, mailed. 6. Where could I get a screw propeller? A. Any maker or dealer in steam or naphtha launches can supply you with one. 7. How large should it be? A. Propeller should be 14 inches diameter.

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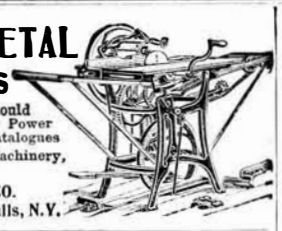

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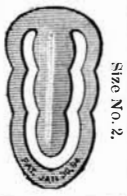

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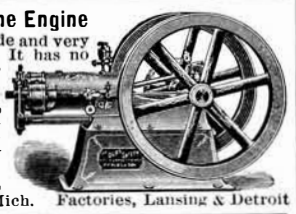

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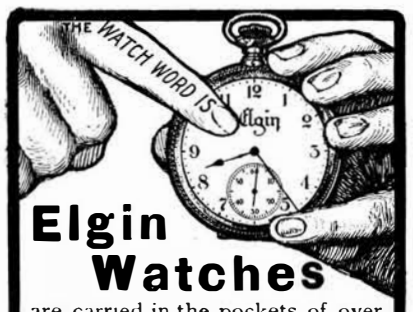

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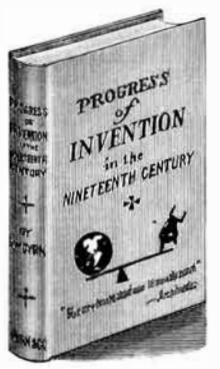

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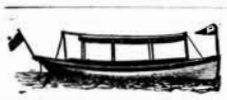

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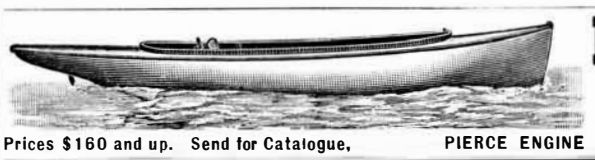

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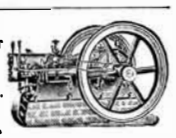

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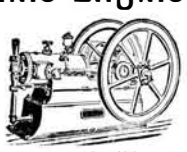

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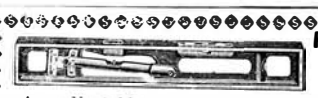

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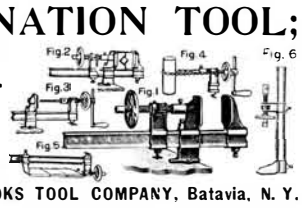

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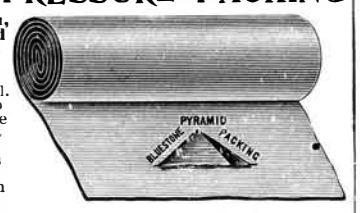

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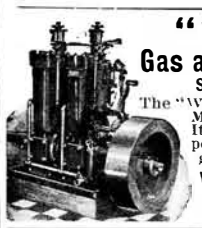

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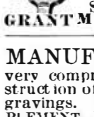

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